Joint Countermine
Advanced Concept Technology Demonstration
Management Plan

Introduction

Purpose

This plan provides the management strategy for the Joint Countermine Advanced Concept Technology Demonstration (ACTD) and serves as a memorandum of agreement among the signators of the plan. It outlines the process to accomplish the objectives of this ACTD.

Objective

The objective of the Joint Countermine ACTD is to demonstrate the capability to conduct seamless amphibious mine countermeasure (MCM) operations from sea to land. The demonstration will be accomplished by integrating Army, Navy, and Marine Corps technology developments and fielded military equipment. This ACTD will demonstrate the coupling of selected current capabilities with developing capabilities, leading to enhanced integration of joint capabilities to conduct countermine operations. The ACTD will also seek to identify improvements in the capabilities being developed or envisioned. The ultimate goal is to demonstrate emerging MCM technologies, operational concepts, and doctrine in MCM support of amphibious and other operations involving Operational Maneuver From The Sea (OMFTS) and follow-on land operations.

Operational Need

Mines are cheap and available worldwide and, along with obstacles, can be used to restrict shipping, landing, and ground operations. MCM capability is a critical element in our ability to conduct joint expeditionary warfare in the world's littorals. It is a key enabling factor for the projection of expeditionary power from sea to land. Therefore, a complete mine and obstacle reconnaissance and countermine capability is necessary to conduct successful MCM operations in littoral areas. Mines and obstacles in the water or on land restrict maneuver, disrupt operational tempo, deny flexibility, and increase friendly casualties. Currently, our forces have limited clandestine reconnaissance capability to define the mine threat. Additionally, our forces have very limited capability to conduct seamless countermine operations during an amphibious assault. The detection, classification, identification, and neutralization of mines and minefields; marking of breached lanes; and the detection and removal/reduction of obstacles are difficult, labor intensive, logistically costly, and dangerous tasks. The countermine capability of the amphibious force once ashore and through the beach area is also limited. Finally, there are only limited joint command and control capabilities to coordinate MCM operations during an amphibious assault.

Payoff

The conduct of this Joint Countermine ACTD will facilitate rapid transition of advanced technologies needed for seamless countermine operations into operational forces, achieve early user assessment of technologies for military worth, and allow development of new operational concepts for employing them. A residual Joint Countermine Operational Simulation (JCOS) capability will allow the continued cost-effective development of concepts, and facilitate equipment and unit optimization, staff training, and exercise scripting. The results of the ACTD will enhance a commander’s ability to maintain freedom of maneuver and control of battle tempo, a necessary prerequisite of battlespace dominance.

Status

The Joint Countermine ACTD is ready for implementation. Initial planning for the ACTD began in FY 94. The ACTD started in the first quarter of FY 95, with major demonstrations planned for FY 97 and FY 98. Follow-on analysis and support for residual equipments will continue through FY 2000.

The ACTD is sponsored and funded by the Deputy Under Secretary of Defense (Advanced Technology). Funding is in place and estimated to be sufficient to meet the objectives of the ACTD. The ACTD itself is fully funded at $68.9 million over the period of its performance. This funding is in addition to that already contained in the core programs of the participating services which support the development and demonstration of specific items of novel equipment. Additional details are contained in the funding section of this plan.

The ACTD management structure has been agreed to and is described in the Programmatic and Organizational Approach section of this plan. Planning is underway and a program management staff is in place. Work has started on the detailed plans necessary to support each demonstration, the JCOS, and Command, Control, Communications, Computers, and Intelligence (C^4I). These plans will be presented for review and approval prior to their implementation. Work by individual Services on items of novel equipment is being carried out now under already established program plans and funding. A Joint Program Office has been established to facilitate day-to-day ACTD management and planning.

Overall Approach

Joint Countermine ACTD Overview

The Joint Countermine ACTD will demonstrate capabilities for extending existing doctrine for OMFTS to a beach defended by a light defense force employing mines and complex obstacles. Clandestine surveillance and reconnaissance will be conducted to determine if gaps in the water and land minefields can be exploited to allow forces to reach their objective. Mine and obstacle clearance in the water and on the beach will be required if gaps in the fields do not exist or are inadequate. Overt reconnaissance, detection, neutralization, and clearance operations will be undertaken when mission requirements make these operations necessary. Command and control links between MCM units and operational commanders will be demonstrated. Distributed interactive simulation (DIS) will be utilized to the fullest extent during the demonstrations.

The Joint Countermine ACTD consists of two closely connected demonstrations. Demonstration 1 (Demo I), planned for FY 97, focuses on the near shore capabilities with emphasis on in-stride detection and neutralization of mines and obstacles in the beach zone and on land. The Army is lead service for this demonstration. Demonstration II (Demo II), planned for FY 98, emphasizes the technologies of clandestine surveillance and reconnaissance as described in the Navy FY 94 Mine Warfare Plan and demonstrates all elements of a seamless transition of countermine operations from the sea to the land. The Navy is lead service for this demonstration.

The Joint Countermine ACTD will employ prototypes from Advanced Technology Demonstrations (ATD) and pre-production phases of the development cycle along with fielded equipment in live demonstrations. In addition, a robust modeling and simulation effort, JCOS, will expand the information base obtained from the live demonstrations through constructive modeling and DIS. C^4I connectivity and notional architectures for MCM will also be demonstrated. Extensive operational user involvement supports the development and evaluation of doctrine, tactics, techniques, and procedures and the assessment of organizational impacts of the new technology prototypes. Select items of equipment and simulations will remain with the operational user for a 2-year extended evaluation.

Background

The Joint Countermine ACTD expects to demonstrate a significant improvement in the military capabilities required to conduct MCM operations. Although several new mine countermeasure systems have been under development since the Gulf War, none have yet been fielded. This ACTD will demonstrate the ability of the new, developmental systems to work in concert with those already fielded in overcoming the problems posed by mines and obstacles, both in sea and surf areas and on the beach. Early and continuing user involvement will aid in the development of realistic and effective systems employment concepts and tactical doctrines and facilitate the transition of successful systems to the operating forces. The residual equipments and systems retained by users will provide a limited operational capability, which could be used to support contingency operations, and provide a feedback mechanism that can be used to refine both the equipments themselves and the tactical doctrine under which they will be employed.

This ACTD strongly supports the doctrine found in “Concepts for MCM in Littoral Power Projection” (FMFMRP 14-25) and Army Requirement document (FM 525-5). The ACTD contains projects addressing deficiencies in each current major area of countermine operations, except Mining Prevention which is outside of the scope of the ACTD. Key near-, mid-, and far-term countermine operational requirements are shown in Figure 1.

Planning Horizon	Requirement	ACTD
Near -term	• Aggressive doctrine and mindset	
	• Training and education	
	• C^4I	X
	• Fire support capability	
	• Vertical lift capability	
	• Integration of MCM in the power projection force	X
Mid-term	• Improved clandestine mine reconnaissance, marking, and monitoring capability	X
	• More rapid clearance capability OTH at sea	
	• Rapid, deliberate breaching capability	X
	• Amphibious fighting vehicles capable of combat maneuvering at high speed	
	• Responsive supporting arms	
	• Improved integration of MCM and power projection forces in NEF. Improved C^4I connectivity	X
Far-term	• In-stride mine neutralization for ships at sea	
	• Organic in-stride breaching with assault waves	X
	• Clandestine reconnaissance of mines and obstacles at sea and on land	X
	• Elimination of mine threat through destruction, removal, or other, means	X
	• Complete integration of MCM and power projection forces. C^4I provides shared situational awareness at all force levels	X

Key Requirements for MCM in Amphibious Power Projection
Figure 1

Operational Scenario

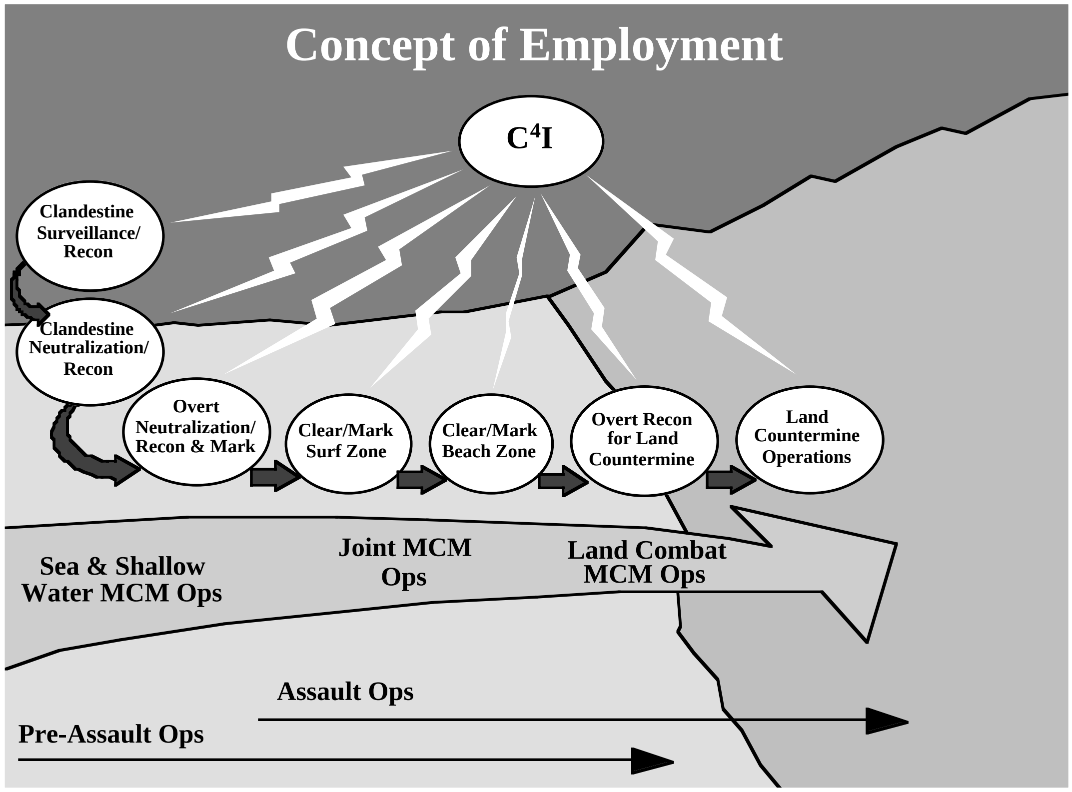
The Demonstration Scenarios are in consonance with existing doctrine and support the further development of emerging concepts, doctrine, and tactics. They have been constructed to allow demonstration and evaluation of a wide variety of existing and emerging operational concepts, capabilities, systems, technologies, and force structures.

The scenarios support the current general sequence of MCM operations starting with clandestine reconnaissance and preparation, and includes Overt Reconnaissance and Preparation; Breaching, Assault, and Exploitation; and Clearing phases of operations. The anti-mining and isolation/suppression phases are not specifically addressed by the ACTD but may be included in the scenario by the operational commanders to enhance the value of the exercise for participating forces.

The successful demonstration of new ACTD systems and user-developed operational concepts will address key mid- and far-term MCM requirements and help improve the surprise factor, speed, and effectiveness of future MCM operations. The ultimate goal is to achieve a shortened, more rapid sequence of only the Anti-mining; Clandestine Reconnaissance and Preparation; Detection, In-stride Breaching, and Marking; and Clearing (proofing) phases of operations.

A Joint Task Force will conduct an expeditionary mission into a littoral area. The enemy has well prepared defenses in the intended landing area, including mine and complex obstacle barriers.

Although battlespace dominance has been gained within the amphibious operational area and the beach is only moderately defended, a motorized rifle regiment with a full complement of normal reinforcing elements is positioned to reinforce the beach defenses within 6 to 8 hours. The MCM functions (Figure 2) will take place against this background and within the context of an amphibious assault.



Amphibious Assault Countermine Operations
Figure 2

This ACTD supports the emerging concept of a two-phase amphibious operation: (1) pre-assault and (2) assault. In addition, some scenarios may include landings well behind the immediate beach area by Army or Marine Corps forces to seize critical road, air, or other facilities.

During the pre-assault phase, general planning and preparation for the actual assault are carried out. Operations are conducted in a clandestine manner to deny knowledge of the time and place of the assault to the enemy. Clandestine surveillance of the area for mines, obstacles, and other impediments to an assault; clandestine mine and obstacle clearance; covert marking of clear areas; and processing and dissemination of tactical information with regard to the MCM picture take place during this phase of operations.

During the assault phase, MCM operations become overt, with clearance speed and thoroughness taking precedence to facilitate the rapid clearance of critical areas while minimizing overall casualties. Marking of the cleared areas is conducted in an overt manner. As in the pre-assault phase, the processing and dissemination of information on the MCM tactical picture is of paramount importance, both to exploit cleared areas or gaps in the defenses and to aid in the efficient allocation of MCM assets. Once ashore, land countermine operations emphasize breaching of mines and obstacles in the operational area to facilitate force movement and resupply. Joint MCM C^4I becomes increasingly important as battle emphasis shifts ashore with the Army and Marine Corps forces.

The demonstration scenarios incorporate the standard MCM missions and functions associated with an amphibious assault or forcible entry from the sea. Possible candidate or supporting technologies and systems that will be demonstrated during the ACTD demonstrations are noted in the Novel Element and Military Equipment sections of this plan. The phases and functions of the demonstration parallel those of an actual amphibious assault and will take place in the same approximate chronological order, with some actions taking place concurrently as they normally would. Actual systems and equipment will be used to the maximum extent possible, but some capabilities may be simulated when the actual equipment is unavailable or not available in sufficient quantity to fully demonstrate the capability or where peacetime considerations dictate simulation to ensure the safety of operational personnel. Figure 3 shows MCM capabilities required at various levels of conflict.

The first operational capability to be demonstrated is the clandestine surveillance and reconnaissance of the water areas adjacent to the beach and the beach areas themselves. A thorough reconnaissance and surveillance will be made to provide the operational commander with a detailed up-to-date picture of the assault area with regard to the presence of mines and obstacles. This will facilitate planning and help determine the pace and timing of the assault as well as the specific MCM forces necessary to support it. During the ACTD demonstrations, clandestine surveillance and reconnaissance will be conducted using all available resources.

Level of Conflict	Scenario	Phase	Tactics/Functions
Low to Medium Intensity	Third World	Pre-Assault Operations	Clandestine Surveillance/ Reconnaissance of SW, VSW, SZ, Beach Area Mark Gaps C4I
		Amphibious Assault Operations	Reconnaissance/Detection of SW, VSW, SZ, Beach Area Mark Gaps C4I
		Land Combat Operation	Tactical Reconnaissance/Detection Back Beach Mark Breakthrough Lanes C4I
Medium to High Intensity	North Korea	Pre-Assault Operations	Clandestine Surveillance/ Reconnaissance of SW, VSW, SZ, Beach Area Clandestine Clearance in SW, VSW C4I
		Amphibious Assault Operations	Reconnaissance/Detection of SW, VSW, SZ, Beach Area Clear/Mark SW, VSW, SZ Neutralize/Mark Gaps C4I
		Land Combat Operation	Tactical Reconnaissance/Detection Back Beach Neutralize/Mark Breakthrough Lanes C4I
Low to High Intensity	Peacekeeping and Operations Other Than War	Ship to Shore Movement	Surveillance/Reconnaissance of SW, VSW, SZ, Beach Area Mark Gaps C4I
		Beach Area/Port Consolidation	Reconnaissance/Detection of Beach Area/Port C4I
		Inland Movement/ Operations	Tactical Reconnaissance/Detection Back Beach Port C4I

MCM Capability Requirements
Figure 3

Demonstration of supporting communication links and the development of a common tactical picture will receive particular emphasis. The primary functions of the MCM communication links and information processing and display systems are to receive and assimilate data from sensor/collector systems, process and display the data, and transmit relevant information to commanders and operational forces. Data transmission, reception, and processing will be done in as nearly real time as possible.

Prior to initiation of the assault, priority operations include clandestine mine and obstacle neutralization in shallow water through the beach zone and the covert marking of mines and obstacles or areas clear of mines and obstacles. Such actions deny the enemy knowledge of operational intentions and facilitate a flexible, high speed assault operation, preserving MCM assets for use in other areas and reducing potential casualties. The ACTD will demonstrate clandestine capabilities to accomplish these functions during the pre-assault phase of the operation.

Supporting fires and overt MCM operations will signal the actual assault phase. During assault operations, reconnaissance and detection operations will continue as long as feasible, but at a higher operational tempo. Overt reconnaissance and detection systems of various types will be used to update and refine the mine and obstacle problem throughout this phase of the operation. Reconnaissance and detection activities will continue on both land and sea until neutralization, marking, or successful bypass of the mine/obstacle hazards is achieved.

Concurrent with the assault from the sea by Navy and Marine Corps forces, Army Airborne and Special Operations units will secure an airhead inland. In preparation for follow-on heavy forces, the Army assault unit must clear the runway and expand the lodgment. The greatest threat to these forces is the presence of unexploded ordnance and mines (as the threat force is assumed to have an extensive quantity of anti-personnel and anti-tank mines).

Countermeasure systems must mark the lanes and areas clear of mines/obstacles to allow safe passage of follow-on forces. Several types of marking and navigation systems, both land and sea, will be demonstrated during the ACTD, including current and emerging technologies in beacon type markers, electronic navigation and mapping aids, and other visual/physical markers.

While neutralization of mines and obstacles will be undertaken only to the extent necessary to successfully carry out the mission, it is expected that they will be required during operations which involve landings or other operations in defended areas in spite of best efforts to avoid minefields and obstacles. Consequently, the ACTD will also display our capability to clear and neutralize mines and obstacles both in the water and on the beach. Operations may occur in several areas at the same time as would be the case in an actual assault. Clearance effectiveness and speed are key factors in facilitating the rapid buildup of combat power ashore and the subsequent breakout from the beach or landing areas and will be carefully considered during the conduct of the ACTD.

The transition from amphibious operations to land combat is complex. Any loss of momentum and combat power must be acceptable to overall mission accomplishment. MCM support ashore is essential to successful transition.

During the demonstrations, mine and obstacle clearance on land areas will be accomplished by forces using a variety of both developmental and operational MCM equipment. The ACTD will demonstrate the capability to breach, mark, report, and clear lanes through minefields and obstacles. Ground marking systems will be used to mark gaps on land.

C^4I is an overarching consideration in this ACTD, in which reliable, joint C^4I links between land and sea MCM forces will be demonstrated. While critical during any military operation, C^4I is even more important, difficult, and complex during amphibious operations involving joint and possibly allied forces. The ACTD will take special care to ensure these needs are addressed.

During the demonstrations, MCM C^4I will be required to transmit data from sensor/collector systems, process that data, and transmit relevant all source information to the force commanders, MCM units, and other units in support of the MCM forces. This includes the analysis, processing, display, and dissemination of information, suitably classified/sanitized, during all phases of counterobstacle/countermine operations. Data reception and processing should be as nearly real time as possible and utilize processing that fully exploits sensor/collector capabilities.

Distributed Interactive Simulation

Simulation will play a key role in the ACTD and will be used to evaluate emerging countermine systems, countermine ACTD components, doctrine, and tactics in a variety of scenarios and tactical situations. Thus, the JCOS is a critical component of the ACTD. Development and execution of the JCOS is a Navy responsibility.

Within the context of selected scenarios and concepts of operation, the JCOS will simulate each function of the novel systems and appropriate military equipment in a distributed, interactive, training, and tactical decision-making simulation. It will provide an operationally phased, functional sequence of events corresponding directly to the live demonstration sequence of events.

A primary thrust of JCOS is early user involvement in developing a new, or enhanced, capability. It will be a tool to: (1) develop operational concepts, doctrine, tactics, and techniques; (2) demonstrate all functional components of the ACTD in an integrated scenario; (3) evaluate concepts and novel systems for military worth; (4) promote joint tactical training; and (5) demonstrate C^4I connectivity.

JCOS will be highly interactive, with the users immersed in a live, constructive, and virtual simulation. This simulation may include analytical models of each system with highly detailed, time stepped, audio and 3-D graphic representations. Each system will be viewed and controlled by an operator, with the Commander Amphibious Task Force/Commander Landing Force and other battle staffs viewing all operations. It will be capable of simulating the entire ACTD, mixing and matching live and simulated systems. It will include embedded operational scenarios that allow freeplay against intelligent opposition forces, scripted scenarios, and interleaving of physically and virtually exercised scenarios. The simulation will be designed for joint countermine tactics development and training. It is intended to remain with operational forces as a residual capability to promote the further development of doctrine, tactics, techniques, and proficiency.

The JCOS will be coordinated with the Defense Modeling and Simulation Office and utilize existing technologies where appropriate (e.g., DIS/Defense Simulation Internet (DSI) protocols, emergent and existing virtual/constructive models).

Concept and Technical Approach

Concept of Operations and System Utilization

MCM operations are characterized by a distinct set of functions and capabilities that are essential for overall mission success. While all are necessary, the priority and scope of each function depend on the operational situation. This ACTD assumes a medium-to-high intensity level of conflict and takes place in accordance with the overall operational scenario described above. Specific activities which will be demonstrated are described below. Figure 4 shows their relationship to the phases of a typical amphibious assault.

Phase	MCM Functions	Technology / Systems Demonstrated
Pre-Assault	Clandestine Surveillance & Reconnaissance of Littoral Area	Hamlet's Cove, SEALs & NMRS
	C4I, Processing & Dissemination of Mine and Obstacle Data in Support of Pre-Assault Operations	C4I Systems AN/KSQ-1 MCM Cmd & Spt Shp (MCMCSS) Extended C4I Systems
	Clandestine Mine & Obstacle Clearance -- SW thru BZ	SEALs
	Clandestine Gaps Marking -- SW thru BZ	SEALs C4I Systems Extended C4I Systems
Assault	Overt Reconnaissance / Detection of Littoral Area	Hamlet's Cove, SEALs, ML-A, ASTAMIDS, COBRA, Advanced Sensor System, CIMMD
	Overt Mine & Obstacle Clearance -- SW thru BZ	LCAC w/ SABRE & DET System; ALISS; AMCM Mechanical & Influence Sweeps; SMCM Hunting, Mechanical & Influence Sweeps; JAMC; MICLIC; ACP; ORSMC; OBS; APOBS
	Overt Gaps Marking -- SW thru BZ	BLNS, JAMC, CLAMS, Assault Breach Marking System, C4I Systems, HEMMS
	C4I in Support of Amphibious Assault MCM	AN/KSQ-1, MCMCSS, Extended C4I Systems
	Overt Recon/Detection on Land	ASTAMIDS, CIMMD
	Mine/Obstacle Neutralization on Land	SMB, ORSMC, ACP, CBV, MICLIC, APOBS
	Gaps Marking on Land	CLAMS, Assault Breach Marking System, C4I Systems, HEMMS
	C4I in Support of Land Operations	Extended C4I Systems , CAC[2]

Systems/Techniques to be Demonstrated
Figure 4

While not shown explicitly in Figure 4, the collection and dissemination of environmental data will play an important role during all phases of the effort. When combined with existing synoptic information, this data will provide MCM forces with an up-to-date picture of the environment to predict sensor performance and assist in planning MCM operations.

Clandestine Surveillance/Reconnaissance

The demonstration of clandestine surveillance and reconnaissance may include satellite imaging systems and other sensors as part of the Hamlet's Cove program, the Near-term Mine Reconnaissance System (NMRS), and Naval Special Warfare Sea, Air, Land (SEAL) personnel in Advanced SEAL Delivery Systems. The NMRS is a clandestine reconnaissance Unmanned Underwater Vehicle (UUV) system launched and recovered from a 688-class nuclear submarine. NMRS will be capable of mine detection, classification, and localization in littoral waters. It will transmit reconnaissance data in real time to the SSN, via an expendable fiber optic microcable, where it will be processed and forwarded to operational commanders. SEAL personnel, if available, will perform clandestine reconnaissance in very shallow water (VSW).

Overt Reconnaissance and Detection

Overt minefield reconnaissance activities may involve the Coastal Battlefield Reconnaissance and Analysis (COBRA) System, the Airborne Standoff Minefield Detection System (ASTAMIDS), Advanced Sensors, and the Magic Lantern-Adaptation (ML-A) system. For land countermine operations, the Army will provide the Close-in Man Portable Mine Detector (CIMMD) that utilizes an integrated sensor suite to detect surface and buried metallic and non-metallic land mines. The COBRA system is a remotely controlled airborne platform that detects minefields on the beach. The ASTAMIDS is an airborne system for the detection of minefields on beach and land areas. The Remote Minehunting Operational Prototype (RMOP) vehicle tows sensors that detect and classify moored and bottom mines, reporting their positions to the command ship. Pending successful technical demonstration, the Navy may provide the ML-A system, which is expected to provide reconnaissance of the surf zone and beach for anti-invasion, anti-landing, and anti-tank minefields.

Breaching

In-water minefields and obstacles will actually be breached during the demonstration using various countermine systems, or the capability will be simulated. These countermine systems include airborne mechanical and influence sweeps, the Advanced Lightweight Influence Sweep System (ALISS), Landing Craft, Air Cushion (LCAC) deploying the Shallow Water Assault Breaching (SABRE) system, Distributed Explosives Technology (DET) system, and Breach Lane Navigation Sector Light System. Minefield/obstacle breaching/marking and area clearance operations on the beach and inland may employ the Joint Amphibious Mine Countermeasures (JAMC) system. JAMC utilizes remote controlled tractors equipped with mechanical, explosive, and electromagnetic mine neutralization equipment as well as visual and electronic marking systems. This system provides a cleared lane on the beach and land areas. Other land mine clearance activities may involve the Off-Route Smart Mine Clearance System (ORSMC) and the Army Classified Program (ACP). The ORSMC emulates signatures of land vehicles to draw fire from mines and will be provided by the Army Marine Corps. Explosive systems will be simulated during demos.

C^4I Activities

The ACTD will demonstrate the value of C^4I in the conduct of seamless joint MCM operations from sea to land. It will integrate existing Services' C^4I architectures with new or emerging technologies required to link all MCM forces and appropriate operational commands, thus creating a seamless, interoperable Joint Architecture that supports Army, Navy, and Marine Corps systems.

During pre-assault activities, C^4I activities will include receiving and assimilating minefield and obstacle detection data from clandestine sensors in addition to underwater/beach survey and environmental data. Operational decisions based on interpretation and analysis of this data will be transmitted to the operating units. The major roles of C^4I during beach clearance activities are collection, assimilation, and interpretation of reconnaissance data and coordination of the location and timing of employment of the various countermine systems based on status and progress reports from these systems using existing service C^4I systems extended to include Joint Countermine data. These extended C^4I systems will also disseminate locations of cleared areas and lanes to all maneuver units in real time. Minefield detection data, as well as status and progress reports, will be passed to the Marine/Army commanders ashore through Marine Corps and Army C^4I systems ashore via the Defense Information Infrastructure. The development of the Extended C^4I Systems will be the responsibility of the Navy and utilize the Global Command and Control System (GCCS).

For the ACTD, the data generated by novel systems will be incorporated into the C^4I network simulation effort to demonstrate connectivity and the added warfighting capability of these countermine systems. The resulting C^4I appliqué will be utilized to integrate the novel systems with existing ones during the scheduled demonstrations.

Novel Elements

Novel elements for this ACTD are systems associated with clandestine reconnaissance and surveillance, overt reconnaissance, and mine and obstacle neutralization and sweeping. A brief description of the planned final capability each novel element is provided in Figure 5, with more detail contained in Appendix B.

Elements	Description
Hamlet's Cove	Synergistic capability of national and tactical sensors to collect intelligence information to support littoral warfare.
Near-Term Mine Reconnaissance System (NMRS)	NMRS is a submarine-launched UUV with mine detection and classification sensors. NMRS is being developed as a special category acquisition program for fleet delivery/use.
Advanced Sensors	Candidate underwater sensors include: a torodal volume search sonar, which rapidly detects and classifies volume mines in deep shallow water by searching the entire water column in a single pass; a high resolution side looking sonar for the detection and classification of proud bottom and close tethered mines in shallow water; a synthetic aperture sonar (low and high frequency) for the detection, classification, and identification of bottom, close tethered, and buried mines in shallow and very shallow water; and an electro-optic sensor (laser line scan) for long range identification of bottom, moored, and drifting mines in shallow and very shallow water.
Magic Lantern-Adaptation (ML-A)	ML-A is a proof-of-concept technology demonstration of gated lidar imaging for the detection, classification, and localization of mine like objects and minefields in the surf zone through the craft landing zone.
Coastal Battlefield Reconnaissance and Analysis System (COBRA)	A Unmanned Aerial Vehicle (UAV) based minefield recon system utilizing multispectral optical sensors; sends data via RF link to a ground station for processing and dissemination.
Airborne Standoff Minefield Detection System (ASTAMIDS)	ASTAMIDS employs a passive infrared sensor on an unmanned airborne platform. An active laser sensor may also be included. Sensor data is linked to a mobile ground station for near-real-time processing and display.
Close-in Man Portable Mine Detector (CIMMD)	CIMMD is a hand held integrated infrared sensor and ground penetrating radar sensor suite with advanced signal processing.
Extended C^4I systems	The Extended C^4I systems will be the Navy systems that link the MCM Command and Support Ship with higher authority as well as selected units.
Distributed Explosive Technology (DET) System	DET consists of a dual-rocket-deployed distributed explosive net launched from a manned LCAC. The net is optimized for the neutralization of mines in the surf zone. Utilizes existing MK22 MOD4 rocket motors and off-the-shelf SX-2 detonating cord explosive. Employs safe launch control (but no fire control) to aid accuracy.
Shallow Water Assault Breaching System (SABRE)	SABRE is a rocket-deployed explosive line charge launched from a manned LCAC. The system utilizes the existing MK22 MOD4 rocket motor. SABRE is optimized for the clearance of mines and the reduction of light obstacles in the surf zone.
Explosive Neutralization (EN) Advanced Technology Demonstration (ATD)	The EN ATD consists of three clearance concepts, two for surf zone clearance and one for beach zone clearance. Surf zone concepts include an improved line charge for mine and limited obstacle clearance and a explosive net optimized for mine clearance. Both concepts utilize improved rockets and advanced fire control systems for launching from an MCAC at extended standoff ranges. The third concept uses an unpowered glider guided by Global Positioning System (GPS) to deploy a net of munitions to clear beach zone mines.
Joint Amphibious Mine Countermeasures (JAMC) System	A UGV-based beach/land MCM and marking system, utilizing mechanical, explosive, and electromagnetic subsystems for initial beach clearance.
Off-Route Smart Mine Clearance System (ORSMC)	A UGV-based land MCM system which projects tactical vehicle seismic, acoustic and infrared signatures to neutralize off-route smart mines.
Army Classified Program (ACP)	Detailed description of higher classification.
Advanced Lightweight Influence Sweep System (ALISS)	ALISS is an influence source which could be mounted on a remote-controlled vehicle. It utilizes a superconducting magnetic solenoid and an advanced acoustic source to sweep magnetic and acoustic influence mines in VSW. It simulates combatant and assault craft by emulating their signatures and meets the goals of the over-the-horizon in-stride shallow water mission.

Novel Element Description
Figure 5

Demonstration Integration and Limitations

The demonstrations will focus on validating the military worth of emerging countermine technologies, use concepts, and employment doctrines. They will integrate novel countermine equipment and related tactics, techniques, and procedures into established Joint Training Exercises (JTX) in coordination with the user sponsor. Since these exercises are based on already existing doctrine and organic equipment, the Demonstration Managers will blend the novel hardware into the exercise scenarios to meet demonstration objectives and the needs of the user sponsor. Specific details, including data collection and post-demonstration analysis needs, will be provided in the execution plan for each demonstration.

The state of maturity of each novel element system and safety considerations will dictate the degree to which each novel element system will participate in the demonstration scenarios. Figure 6 shows their current estimated availability. The estimates took current system status and the following factors into account:

- Most of the novel element systems will be either prototypes or retrofitted hardware still in the process of evaluation. Specific equipments may not be designed or constructed to meet full military specifications and may not withstand the rigors of an amphibious environment for extended periods of time.

- The level of system maturity may require pre-employment staging or other special support.

- Personnel training will be limited only to those units actually involved in the operation of a specific system.

- Some explosive systems will be simulated due to range or other safety limitations.

- Operational safety is of paramount concern and may limit or preclude the employment of specific systems in a particular demonstration scenario.

Element	Demo	Description
Clandestine Surveillance/Recon		
Hamlet's Cove	I and II	Demo I will employ existing sensor and exploitation capabilities. Data will be collected, exploited, and disseminated. Demo II will have the same sensors but with improved processing capabilities.
Near-Term Mine Reconnaissance System (NMRS)	II	A single, preproduction module of 2 UUVs with sensors and SSN-based control.
Advanced Sensors	II	The sensors will be available for Demo II for a proof-of-concept demonstration. The sensor package may need to be towed by a surface craft due to the limited availability of an underwater vehicle.
Overt Reconnaissance		
Magic Lantern-Adaptation (ML-A)	I and II	ML-A will consist of a commercial-based sensor integrated into a helicopter platform. It will be contractor operated.
Coastal Battlefield Reconnaissance and Analysis System (COBRA)	I and II	Sensor hardware will be an ATD brassboard multispectral camera system. Data will be recorded and post-processed with breadboard equipment. COBRA will be operated and flown by contractors on a commercial aircraft.
Airborne Standoff Minefield Detection System (ASTAMIDS)	I and II	The DEM/VAL ASTAMIDS prototype will be a passive thermal image, possibly with laser illumination, mounted on a manned fixed-wing aircraft. The ground control station will be rackmounted and commercially hardened. Data will be processed in real time by the Mine Detection Algorithm and Processor (MIDAP). The MIDAP will disseminate minefield location over the MCM C^4I net to the maneuver commander. The ASTAMIDS ground control station may be operated by military personnel, while the aircraft will be flown by contractors.
Close-In Man Portable Mine Detector (CIMMD)	I and II	CIMMD will feature enhanced ATD hardware consisting of a helmet-mounted thermal imager and processing packet and a hand-held ground penetrating radar. These systems will provide the operator with independent data presentation for comparison/verification and individual fusion of data.
Extended C^4I systems	I and II	This is an ACTD system that will integrate the novel element systems into existing C^4I networks.
Breaching		
Distributed Explosive Technology (DET) System	TBD	Inert systems and launch controllers may be available as the development and testing schedule allows. Performance data from developmental tests (DT) will be made available upon request to support simulation and modeling efforts.
Shallow Water Assault Breaching System (SABRE)	TBD	Inert systems and launch controllers may be available as the development and testing schedule allows. Performance data from DT will be made available upon request to support simulation and modeling efforts.
Explosive Neutralization (EN) Advanced Technology Demonstration (ATD)	I and II	TBD
Joint Amphibious Mine Countermeasures (JAMC) Systems	I and II	JAMC will demonstrate ATD brassboard hardware. Explosive systems will be simulated.
Off-Route Smart Mine Clearance System (ORSMC)	I and II	ORSMC will demonstrate ATD brassboard hardware.
Army Classified Program (ACP)	I and II	The ACP platform for the ACTD will be an M1 chassis.
Advanced Lightweight Influence Sweep System (ALISS)	I and II	ALISS will be represented in ACTD Demo I by modeling and simulation only. A refurbished ATD system may be available for Demo II.

Novel Element Availability in ACTD Demonstrations
Figure 6

13 September 95

Military Equipment

Other (not novel) elements which may be included in the ACTD are listed in Figure 7. These equipments are already fielded systems or systems available in the FY 96/97 timeframe.

System	Utilization
MCM Support Ship	Command and support platform for forward deployed MCM operations.
Navy Special Warfare SEALs	Clandestine mine reconnaissance and mine clearance in VSW.
Combat Engineers	Sapper, mine detection, neutralization, breaching, complex obstacle reduction.
AMCM Mechanical and Influence Sweep	Mechanical sweeps sever moored mine cables. Influence sweeps actuate acoustic/magnetic influence mine mechanisms.
Obstacle Breaching System	Clears mines and obstacles with unguided and guided munitions.
AN/KSQ-1	Amphibious Command and Control System.
Breach Lane Navigation System	Mechanical system for marking breach lanes in surf zone.
Anti-Personnel Obstacle Breaching System	A rocket-launched line charge clears footpath through anti-personnel mines and light obstacles.
M1 Tank with Full Width Mine Plow	Mine plow mounted to front of tank clears/removes surface and buried mines from within the width of the tank track.
M58 Line Charge	Clears path through anti-personnel and anti-tank mines and light obstacle fields.
ABMS (PATHFINDER)	Assault lane marking system.
CBU-88 Tactical Obscurant	Air deployed aerosols such as smoke visually obscure friendly movements and operations from hostile forces. Other air deployed aerosols highly attenuate friendly infrared and radio frequency signatures of friendly forces.
Remote Minehunting Operational Prototype (RMOP)	A remotely controlled semisubmersible vehicle towing minehunting sensors.
SLS-Beach Lane Navigation	Tripod-mounted NDI light that projects a multicolor light beam with a square cross section. The beam is projected back along the centerline of the breached lane. The operator knows the location in the lane by observing beam color.
Combat Breacher Vehicle (CBV)	A land minefield and obstacle breaching vehicle for lane clearance in support of assault forces.
Navy EOD	Mine detection, location, neutralization, exploitation and clearance
Navy MMS	Moored, bottom, and buried mine detection, location, and neutralization
SMCM Mine Hunting	Mine detection, location, and clearance
SMCM Mechanical and Influence Sweep	Mine detection, location, and clearance

Supporting Military Equipment and Capabilities
Figure 7

Risk Assessment

The following risk assessment for participating novel elements is based on the system's ability to participate in the ACTD demonstrations and to assist in achieving ACTD goals.

Novel elements participating in this ACTD have manageable risk. Risk areas will be monitored by the Joint Demonstration Managers, who will remove a novel element from the demonstration if the risk becomes unacceptable. Individual ATDs and projects have risk mitigation plans. A major technical challenge for new countermine technologies is the development of sensors and image processing that differentiate mines from clutter in the sea and within the varying soil conditions and types of foliage on the beach and inland. The most challenging is mine detection in the surf zone, where the water is turbulent and opaque to electro-magnetic fields.

As in any program of this magnitude and complexity, risk assessment is somewhat subjective. Risk will be assessed continually as the ACTD progresses to identify potential problem areas. The Demonstration Managers and supporting entities will apply risk management practices to correct identified deficiencies and mitigate risks, consistent with the achievement of overall ACTD objectives. The Joint Demonstration Managers will work with the individual Program Managers to evaluate potential problems and identify alternative courses of action. The programs supplying the novel element technologies will perform related testing, background data collection, and appropriate integration activities as part of their baseline program. These activities are not separately funded in this ACTD.

Cost, schedule, technical, and overall risk are outlined in Figure 8. These assessments assume that present funding lines are maintained as planned throughout the life of the ACTD. A more detailed risk assessment of the individual novel elements is contained in Appendix C.

System	Issues	Technical Risk	Cost Risk	Schedule Risk	Overall Risk
HAMLET'S COVE	Resolution, processing, and information dissemination are risk areas.	MED	MED	MED	MED
NMRS	Technical risk is low; schedule risk is mitigated by acquisition streamlining initiatives.	LOW	LOW	MED	LOW-MED
ADVANCED SENSORS	The primary risk is commitments to other programs.	MED	MED	HIGH	HIGH
MAGIC LANTERN-A	Image processing and performance in turbid waters are risk areas; tests occur in FY 94-95 timeframe.	MED	HIGH	MED	MED
COBRA	Automatic target recognition/image processing are risk areas.	LOW	MED	MED	MED
ASTAMIDS	The primary risk area is algorithm development.	MED	LOW	HIGH	MED
CIMMD	Detection in high clutter environments is the primary risk. The ATD will be completed in FY 95.	MED	LOW	LOW	MED
DET	Requires stable platform to launch.	MED	MED	MED	MED
SABRE	The schedule for integration of SABRE onto the MCAC has not yet been approved. Explosive safety certification may not be completed in time for ACTD.	MED	MED	MED	MED
EN ATD	Risk is launch system and seaborne platform.	HIGH	HIGH	HIGH	HIGH
JAMC	Streamlined schedule.	MED	MED	LOW	MED
ORSMC	Capability to operate at speeds fast enough to support the maneuver force and side attack mine neutralization capability are operational concerns.	MED	LOW	LOW	MED
ACP	Risk is classified.				
ALISS	Superconducting and spark gap technology not yet demonstrated.	HIGH	HIGH	HIGH	HIGH

Risk Assessments for Novel Systems
Figure 8

While the JCOS and the MCM C^4I systems are not novel elements in themselves, they are critical integrating elements of the ACTD. Because of their importance to the overall success of the ACTD, the risks associated with each development effort were also examined as part of the initial preparation work for the ACTD.

The risk associated with the development and implementation of the JCOS end-to-end simulation is medium. While high-level engagement and limited campaign models currently exist and are in regular use, they need to be adapted to the specific needs of the ACTD effort. This includes integration of novel element system models, models for fielded systems not already incorporated in the high-level models, and the MCM C^4I system. Risk will be mitigated by upfront emphasis on overall system architecture, use of existing models and commercial-off-the shelf (COTS) hardware to the maximum extent possible, and use of a dedicated JCOS Project manager to spearhead the effort with assistance from a JCOS advisory panel comprised of modeling and simulation experts from both the development and user communities.

The risk associated with development of the MCM C^4I system is low to medium. The great majority of the communications hardware and links already exist within the individual services. The challenge is to integrate them into an effective joint architecture that meets the needs of both commanders and operational units in Joint Countermine operational scenarios. Processing and display of information must also be adapted to meet the specific needs of the ACTD. Risk will be mitigated by use of existing communication links and COTS hardware and software. As was the case in the JCOS development effort, a dedicated MCM C^4I project manager has been established to oversee the effort with assistance from a C^4I advisory panel.

Affordability

This ACTD focuses on the demonstration of new and developing capabilities coupled with existing systems–not just improvements of existing systems. It provides a vehicle for integrating new and developing novel elements with existing military equipment into a new functional operational capability–joint countermine operations in support of amphibious assaults–a capability which does not exist at this time. Affordability of each of the individual capabilities, and the overall capability itself, will be fully considered as the detailed demonstration plans are developed and during the demonstrations themselves.

As the demonstration plans develop, and more data from the novel element development efforts become available, the details of the demonstration scenarios may be modified to accommodate the strengths and limitations of each particular system. The scenarios will be modified to strengthen the role of the most effective systems and diminish or eliminate the role of less effective ones, with overall cost being a primary consideration. A major factor in this tradeoff will be the costs of the expected support and logistics tail necessary to support each of the systems. During the demonstration, it may become apparent that, while each system fully achieves its effectiveness goal, fewer or more of a particular system would improve the overall effectiveness of the integrated operation.

Integration of the individual capabilities during the ACTD should help to develop areas of commonality among systems that could reduce their overall cost. For instance, some form of automatic target recognition is involved in most of the surveillance/reconnaissance systems. The integration of the individual capabilities may lead to the selection of common processing hardware/software for several systems that will lead to reduced life-cycle and acquisition costs. Ultimately, the results of the ACTD will help determine which systems, or combination of systems, are "best buys" for the Services to achieve a robust, joint countermine capability.

The Executing Agents will review the developmental status of each of the new capability elements of the ACTD to continuously assess integration/effectiveness/system quantity/cost considerations.

Site, Range Facilities

All facilities support will be arranged through United States Atlantic Command (USACOM) and assigned subordinate units. Most of the Joint Countermine ACTD field demonstrations are projected to utilize air, sea, and land training ranges and facilities on the east coast of the United States. Other ranges and facilities will be scheduled and used as required. Connectivity of exercises and ranges through DIS will be utilized as available and feasible. The Operational Manager, in close cooperation with the Demonstration Managers, is responsible for site/range facility requirements and planning.

The modeling and simulation portion of the demonstrations and the evaluation of concepts, doctrine, technology, and force structure will be conducted at appropriate facilities.

Participating/Opposing Forces

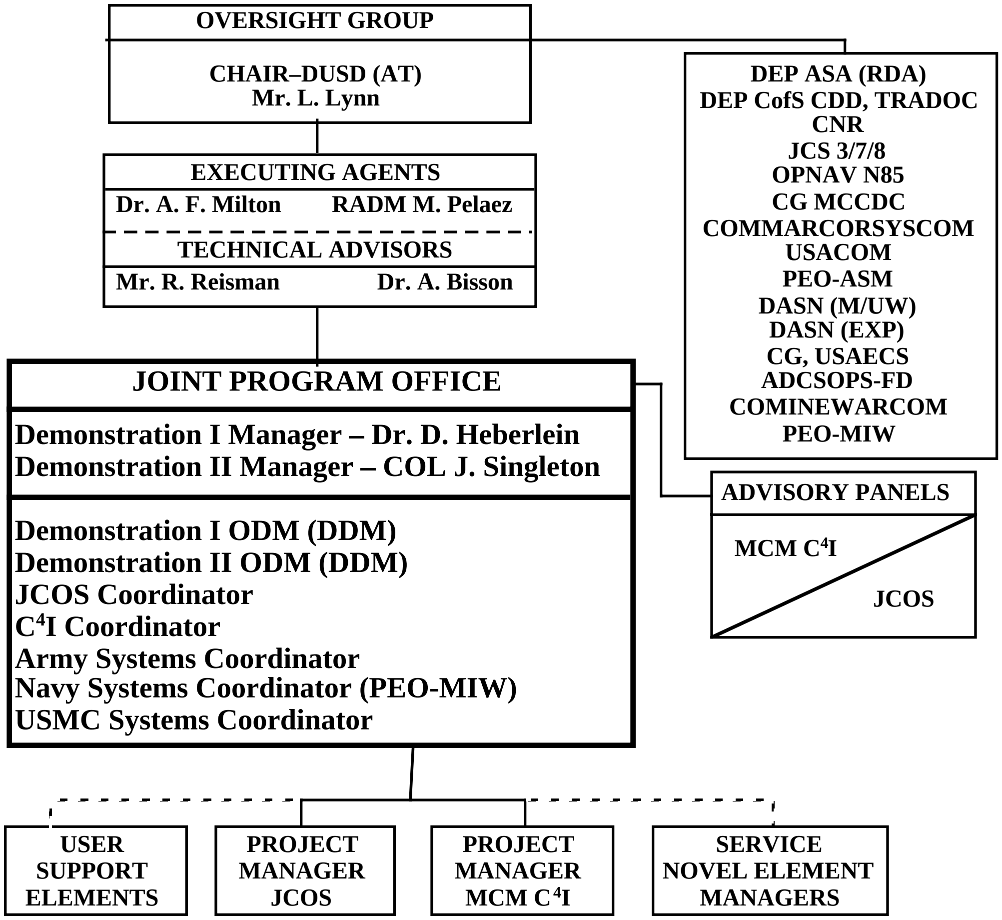
The majority of the joint countermine field demonstrations will be conducted under the auspices of USACOM and assigned subordinate units and will be conducted coincident with scheduled field and command post exercises to the maximum extent possible. The Operational Manager, in coordination with the Demonstration Manager, is responsible for the planning and scheduling of participating and opposing forces and emplacement of exercise minefields and obstacles. Where required, ACTD Demonstration Managers will arrange training for operational forces who will help operate novel system equipment well in advance of the scheduled exercises. Details will be provided in the demonstration execution plans.

Allied/Foreign Participation

No allied/foreign participation is currently planned or expected, but the situation may change as the ACTD develops and if other nations express interest in participating. Foreign participation is not required to meet the objectives of this ACTD.

Programmatic and Organizational Approach

A joint management scheme (Figure 9) has been adopted for the Joint Countermine ACTD. Within this structure, each Service retains control of, and responsibility for, their core programs that support the Joint Countermine ACTD. Individual Service responsibilities include full funding of programs identified for participation in the Joint Countermine ACTD and providing required capabilities according to the schedule developed by the respective Joint Countermine ACTD Demonstration Managers. The project/item managers are responsible for supporting the Joint Countermine ACTD with the quantity of prototypes/equipment indicated in the novel element and other lists provided in this plan.



Joint Management Structure
Figure 9

Oversight Group

An oversight group will be convened and chaired by the Deputy Under Secretary of Defense for Advanced Technology (DUSD) (AT), Mr. Larry Lynn. The oversight group will monitor the conduct of the Joint Countermine ACTD and provide management emphasis within their respective organizations to ensure integrated support for the Joint Countermine ACTD. The oversight group includes the following members: Deputy ASA (RDA) for Research and Technology; Deputy Chief of Staff for Concepts, Doctrine, and Developments, HQ TRADOC; DASN (M/UW); DASN (EXP); CG; USAECS; ADCSOPS-FD; CNR; COMINEWARCOM; OPNAV-85; CG, MCCDC; COMMARCORSYSCOM; PEO-ASM; PEO-MIW; and senior representatives for USACOM and JCS 3/7/8. The oversight group will meet at least semi-annually or as required by the chair. Other participants may be added as required.

Executing Agents

The Executing Agents for the Joint Countermine ACTD are the Deputy for Research and Technology, Office of the Assistant Secretary of the Army for Research, Development, and Acquisition, Dr. A. Fenner Milton, and the Chief of Naval Research (CNR), RADM Marc Pelaez. These Executing Agents provide joint oversight and high level management for the program. The

Executing Agents have the authority to prioritize participating technologies, direct the distribution of funds for the ACTD, and designate the ACTD Joint Program Managers. They will recommend goals and objectives and, in conjunction with the oversight group, will review and determine program status and progress toward objectives. The Technical Advisors to the Executing Agents, Mr. Reisman of Army and Dr. Bisson of Navy, will provide specific Service oversight. This oversight will feed overall ACTD demonstration prioritization process and direction, recommend goals and objectives, and review program status.

Joint Program Office

A Joint Program Office has been established under the authority of the Executing Agents to plan and execute the overall day-to-day conduct of the Joint Countermine ACTD. This office is headed by the Demonstration I Program Manager (DM), Dr. Heberlein, and the Demonstration II Program Manager (DM), Col. Singleton. Their functions are to ensure the connectivity and integration of systems, modeling and simulation, C^4I, and operational concepts to maximize efforts between the demonstration phases. They also work to balance workloads, avoid duplication, and ensure ACTD demonstrations are conducted on schedule. Accordingly, they oversee the obligation planning and commitment of ACTD funding. The Operational Demonstration Manager's (ODM) function will be to ensure coordination of operational concepts, missions, plans, and scenarios for the ACTD demonstrations. The ODM also leads in the coordination of user participants, training plans and schedules, demonstration locations, assessment plans, and demonstration logistics support requirements.

The DM and ODM are jointly responsible for ensuring all activities are consistent with the Joint ACTD schedule and demonstration execution plans. The Joint Program Office will develop periodic briefings and reports for the Oversight Group and other reviewing authorities.

In the accomplishment of these duties, the Joint Program Office will establish an executing staff. This staff will consist of Service System Coordinators, whose job it is to directly interface and monitor the service's novel elements, the JCOS, and C^4I integration in support of the ACTD.

Joint Program Advisory Panels

Due to the Joint Countermine ACTD's complexity, the Joint Program Office will establish two advisory panels. A JCOS oversight panel will be convened to ensure an integrated approach to simulation of the functions of novel elements and appropriate military equipment. Members will be selected from both the user and development communities and the Defense Modeling and Simulation office as required. A C^4I advisory panel will be convened to ensure development of an integrated approach to C^4I functions and operations. Members will be selected from the development, user, and C^4I communities as required. These panels will provide advice to and review proposed approaches for the Joint Program Office.

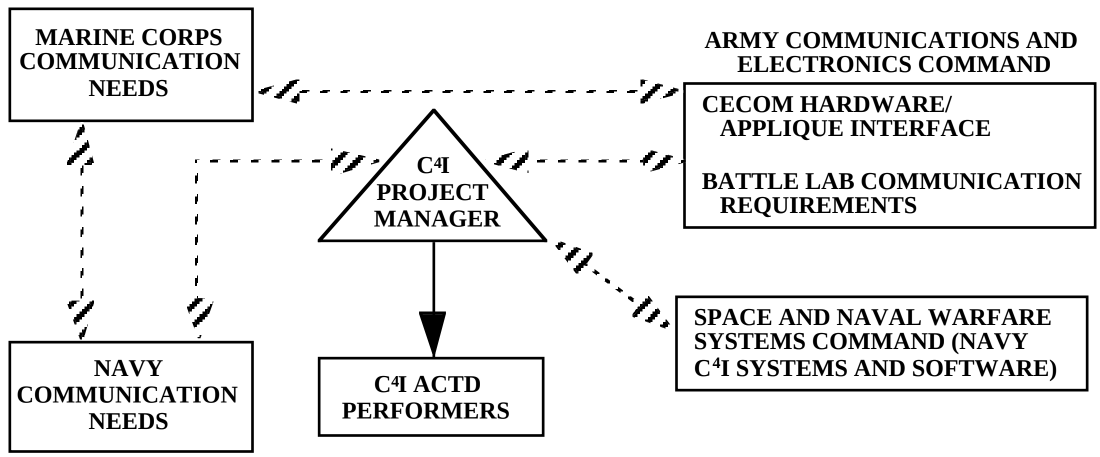
ACTD Project Managers

Service System Coordinators and JCOS and C^4I managers are responsible for the execution of the day-to-day technical and programmatic activities in their specific areas. They are responsible for handling the complex decisions and activities required to ensure their systems are functioning, totally integrated, and available in accordance to the Joint ACTD cost and program schedule. Each Project Manager will be responsive to designated Joint ACTD Program Coordination Officers.

Execution of JCOS is a Navy responsibility. JCOS plays a key role in the ACTD; it will allow the user to develop operational concepts, doctrine, tactics, and techniques; demonstrate functional components of the ACTD in an integrated scenario; and evaluate the military worth of novel systems. The simulation will be designed to facilitate joint countermine tactics development and training and is intended to remain with operational forces as a residual capability.

Execution of the C^4I program will be a Navy responsibility. The C^4I Project Manager, with the assistance of the development and user communities, will determine existing MCM communications shortfalls and take action to develop and field a system which meets ACTD needs. He may call upon the resources of the Space and Naval Warfare System Command, service laboratories, industry, and academia in carrying out this responsibility. The Army Communications and Electronics Command will support the C^4I Project Manager in this effort and will be the Army's point of contact for work in this area. Figure 10 illustrates this relationship.

The ACTD objective is a C^4I system that meets the joint needs of operational commanders and mine MCM forces and requirements for any unique links to support the ACTD demonstrations themselves. This will be accomplished, to the greatest extent possible, by leveraging existing links, systems, and equipment, including those currently under development.



C^4I Program Management Relationships
Figure 10

<u>Procurement and Contracting Strategy</u>

A detailed procurement and contracting strategy is being developed to cover the work required to plan, conduct, and support the ACTD. Maximum use will be made of the additional flexibility and contracting effectiveness offered by the recent acquisition reform initiatives. Appropriate waivers will be sought as needed to ensure ACTD success within available time and resource constraints. In general, the strategy will be to rely, to the greatest extent possible, on already existing contracts, seeking modifications only where necessary, and letting new ones only when required to meet the needs of the ACTD. This strategy will help mitigate overall schedule and obligation risks by reducing the significant lost time and increased costs inherent in the current contracting process.

The major items of novel equipment to be demonstrated during the ACTD will be procured by the agency carrying out their development. These items are at different points in the development and acquisition cycle: in some cases, production equipment will be available; in others, developmental or prototype equipment will be procured. In either event, every effort will be made to avoid disturbance to existing programs, contracts, and schedules. Additional details of the procurement strategy for novel elements will be provided in Demonstration I and II execution plans. The acquisition strategies for the JCOS and C^4I portions of the ACTD will be provided in more detail in their respective execution plans. Other, already fielded equipment and support services will be procured through normal service channels.

Service System Coordinators/System Program Manager Interface

System Program Managers retain full responsibility for the conduct of and results achieved by their respective programs as specified by their cognizant Service Acquisition Executives. ACTD managers will work closely with System Program Managers to determine the best means of bringing their MCM system capabilities to the ACTD demonstrations. They will work closely together to share information on the needs and progress of the ACTD and the individual systems to be demonstrated. They will mutually agree upon program adjustments necessary to meet ACTD requirements and schedules.

The Army, Navy, and Marine Corps are fully committed to the successful completion of the Joint Countermine ACTD and the improvements in warfighting capabilities and knowledge which will result. In the rare event that agreement cannot be reached or problems arise which cannot be resolved at the ACTD Manager/System Program Manager level, the issue will be brought to the attention of the ACTD Executing Agents. They, in turn, will meet with appropriate Program Executive Officers/Service Acquisition Executives to discuss the problem and determine an appropriate course of action. This may include modification of the ACTD, changes to the program schedule of the individual system concerned, or some combination of both courses of action.

Critical Events

This ACTD includes a number of critical events whereby its progress can be measured. These events include the major milestones which represent decision points for the ACTD. Selected critical events for participating novel elements are included in this listing and are representative of the progress of the novel elements overall. Due to the variation in the date of expected delivery to user units, events occurring late in the ACTD are shown as broad periods of continued evolution rather than targeted to a single date.

Event	**Quarter/FY**
Approve ACTD Management Plan	4Q FY 95
Complete JCOS Execution Plan	4Q FY 95
Complete C^4I Execution Plan	4Q FY 95
Request Units for Demonstration Participation	4Q FY 95
Approve Demonstration Execution Plans	1Q FY 96
Request Range/Training Areas	1Q FY 96
Receive Equipment for DEMO I	1Q FY 97
Conduct DEMO I	3Q FY 97
Receive Equipment for DEMO II	1Q FY 98
Conduct DEMO II	4Q FY 98
Complete Analysis of Demonstration Events	3Q FY 99
Follow-on Support and Evaluation	FY 99-FY 2000

Residual Operational Capability

Candidate deliverables and residual capabilities available to the participating units as a result of the demonstrations are indicated in Figure 11. Available residual systems will be identical to the equipment used in the demonstration as described in Figures 5 and 6.

SYSTEM	ORGANIZATION	RESIDUAL QUANTITY
Hamlet's Cove	Navy/USMC TENCAP	TBD
NMRS	Navy	1
Advanced Sensors	Navy	1
ML-A	Navy	TBD
COBRA	USMC	1
ASTAMIDS	Army	1
CIMMD	Army	5
EXTENDED C^4I SYSTEMS	Navy	TBD
EN ATD	Navy	1
JAMC	USMC	3
ORSMC	USMC	3
ACP	Army	2
ALISS	Navy	TBD
JCOS	Navy	1

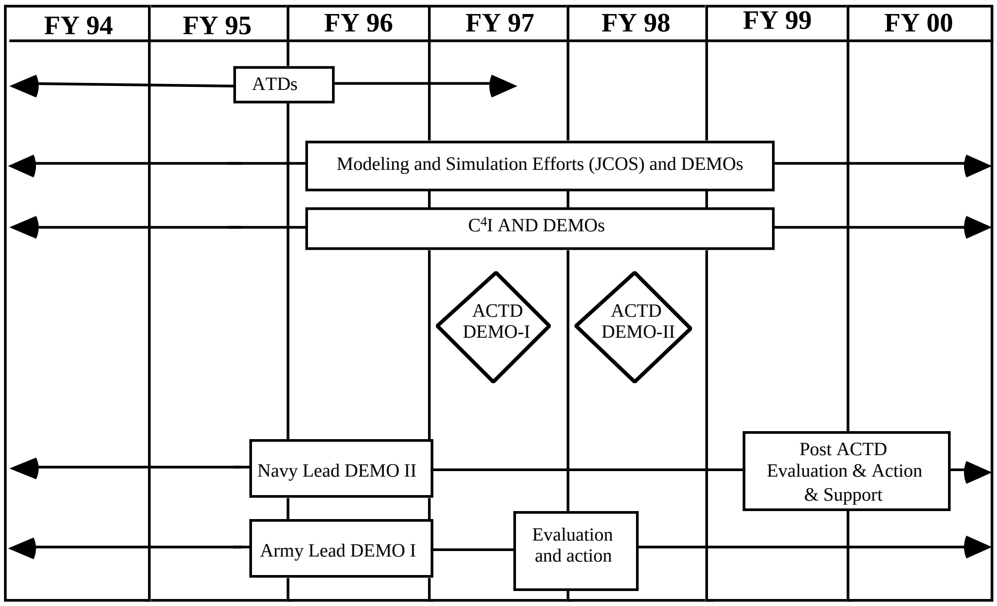
Residual Operational Capabilities
Figure 11

Following the demonstrations, some ACTD hardware will be offered to the operating forces for further use and continued development of tactical and operational concepts for actual user feedback to the materiel and combat system developers. The ACTD will provide funding as specified for 2 years (until the end of FY 2000) after DEMO I and DEMO II. This includes funding for periodic training and maintenance support. Detailed procedures for coordinating the use of ACTD hardware in post-ACTD exercises will be developed with the user sponsor and formalized in the approved execution plan.

The methods for maintaining the residual items, providing user training, and obtaining user feedback during the 2-year extended user assessment will be established in MOAs among the Joint Countermine ACTD Joint Program Office, the user, and the respective material developers.

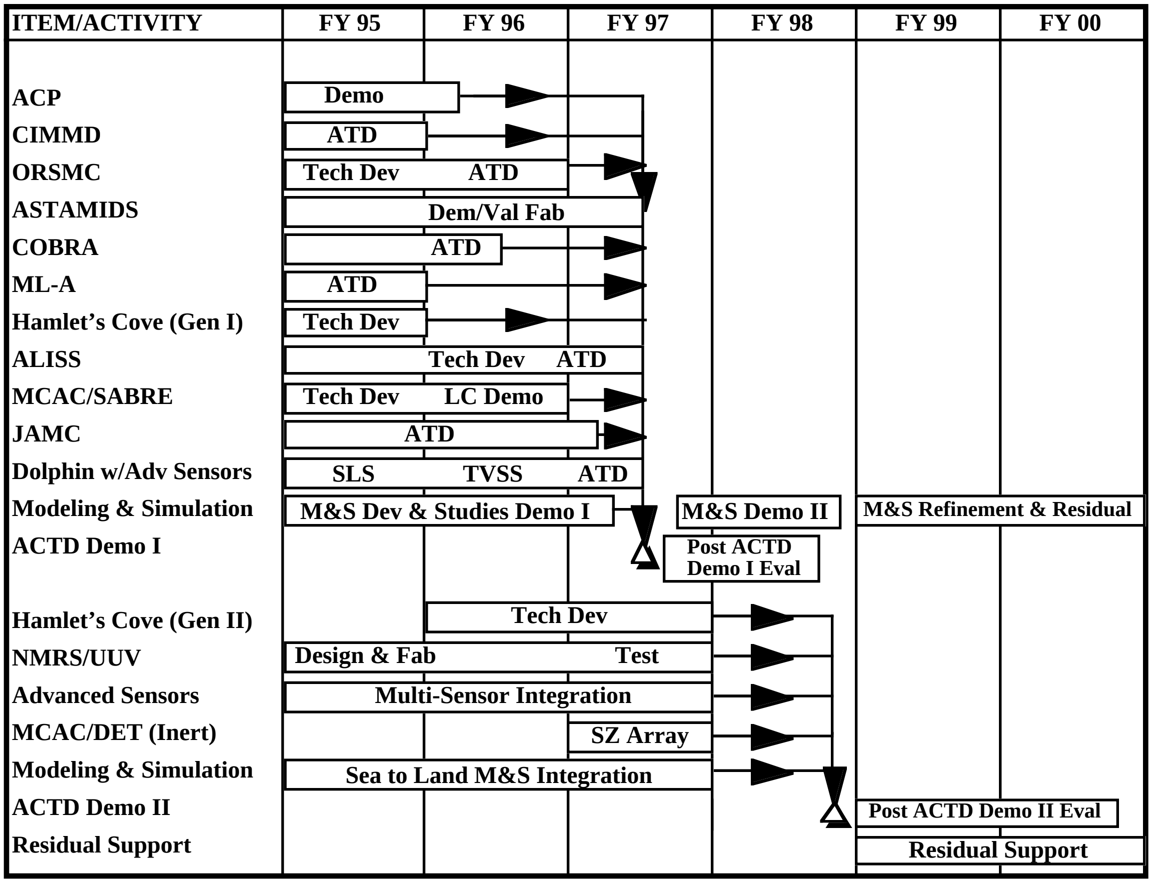
Schedule

The proposed high level schedule for this ACTD is shown in Figure 12. Figure 13 provides additional details and shows the relationship of the novel elements to the proposed schedule.



ACTD Schedule
Figure 12

The individual ATD programs will span the FY 94-97 period. Modeling and simulation efforts for the ACTD will begin in FY 95 and extend approximately 2 years following the demonstration. Detailed workups for the ACTD demonstrations will begin in early FY 96, with the first demonstration occurring in FY 97. Evaluation of the ACTD demonstration and support of the residuals will occur during FY 99 and FY 00.



Joint Countermine ACTD Component Programs Schedule
Figure 13

Funding

ACTD funding information is presented in Figure 14. The indicated costs are those required for execution of the ACTD and do not include existing or planned funding lines for participating systems.

Cost Category	**FY 95**	**FY 96**	**FY 97**	**FY 98**	**FY 99**	**FY 00**
Residuals	5000	5500	4500	4200	1700	1600
Integration of Tech Prog/ATDs	7600	6700	7900	8100	4400	1300
Technical Support	500	3100	3300	3500	0	0
Total by Year ($K)	13100	15300	15700	15800	6100	2900
ACTD Total ($K)	**68900**					

ACTD Funding by Year
Figure 14

The specific details of the funding required for the ACTD are shown in Figures 15 through 17.

CATEGORY	SERVICE	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	TOTAL
DEMO I Support	Army	500	1500	1500	1500	0	0	5000
DEMO II Support	Navy	0	1600	1800	2000	0	0	5400
TOTAL		**500**	**3100**	**3300**	**3500**	**0**	**0**	**10400**

Technical Support Funding ($K)
Figure 15

Technical support funds are required to conduct the ACTD field demonstrations. Funds will be used for site preparation, equipment transportation, demonstration planning, and logistics support.

CATEGORY	SERVICE	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	TOTAL
Modeling &	DEMO I (Army)	500	2000	2200	2000	600	0	7300
Simulation	DEMO II (Navy)	2600	1200	2100	2700	1400	600	10600
Subtotal M&S		3100	3200	4300	4700	2000	600	17900
C^4I	DEMO I (Army)	1500	500	400	300	200	100	3000
	DEMO II (Navy)	3000	3000	3200	3100	2200	600	15100
Subtotal C^4I		4500	3500	3600	3400	2400	700	18100
Total		**7600**	**6700**	**7900**	**8100**	**4400**	**1300**	**36000**

Funding for Integration of Technology Programs/ATDs ($K)
Figure 16

Funds for integration of technology programs/ATDs support development of the JCOS and the architecture, processing, and displays required for a robust MCM C^4I program. Funding will be administered by the Service having program execution responsibility.

HARDWARE ITEM	QTY	SERVICE	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	TOTAL
NMRS	0	NAVY			100	100			200
Advanced Sensors	1	NAVY		450	400	1000	100	100	2050
ML-A	TBD	NAVY			300	200			500
COBRA/ASTAMIDS	1/1	ARMY	2000	1875	425	400	500	500	5700
CIMMD	5	ARMY		500	650	200	150	150	1650
EN ATD	1	NAVY		150	100	400	100	100	850
JAMC	3	ARMY		825	975	100	100	100	2100
ORSMC	3	ARMY		300	450	150	150	100	1150
ACP	2	ARMY	3000	1000	1000	1050	500	450	7000
ALISS	1	NAVY		400	100	600	100	100	1300
Total			**5000**	**5500**	**4500**	**4200**	**1700**	**1600**	**22500**

Planned Funding for Residual Items ($K)
Figure 17

ACTD funds are required to produce multiple hardware copies for operational field demonstrations. Funds are also required to support hardware items available to operational units as "residuals" after completion of the demonstrations. FY 95-98 funds will be used to purchase prototype equipment. Funds in FY 99-2000 provide support for the residual items. OSD funds to support COBRA, ORSMC, and JAMC will be provided through the Army.

Figure 18 provides current core service funding information for novel elements and related modeling and simulation and communications efforts. It reflects current service plans and is subject to adjustment based on program progress, defense needs and Congressional appropriations. This funding is not included in the OSD funding specified in Figures 14-17.

PROGRAM	PE/PROJ NO.	FY 95	FY 96	FY 97	FY 98
HAMLET'S COVE	0602315N	3000	3000	3000	3000
NMRS	0603502N	14673	16394	10612	0
ADVANCED SENSORS	0602315N	9630	9560	9650	9450
ADVANCED SURV & RECONN	0603782N/R2226	0	2492	3627	3000
ML-A	0603782N/R2226	4525	0	0	0
COBRA	0603640M/R2223	2000	1900	0	0
	0603635M/R2247	0	3800	5000	3400
ASTAMIDS	0603619A/D606	23562	15600	0	0
	0604808A/D415	0	0	14800	14300
CIMMD	0603606A/D608	4000	0	0	0
DET	0603502N/Q2131	8140	10600	12391	3400
EN ATD	0603782N/R2226	16018	18600	16500	1000
JAMC	0603640M/C2223	2733	2500	1000	0
ORSMC	0603640M/C2223	1113	2350	0	0
	0603612M/C2104	0	0	3200	4100
	0602786A/AH20	1500	0	0	0
	0603606A/D608	1000	2200	0	0
ACP	Details at higher classification				
ALISS	0603782N/R2226	12946	10600	9265	0
	0603502N/R2141	0	0	0	6690
SABRE	0603502N/Q2131	5408	5645	3602	5100
MEDAL[1]	0603785N/R2127	1800	1500	1500	1500
M&S	0602315N	1400	2500	2500	2500
	0603782N/R2226	0	1000	1500	1500
	0603606A/D608	2100	2100	1400	1000

President's Budget Submission for Novel Elements as of January 1996 ($K)
Figure 18

[1] **MEDAL–Mine Warfare Environmental Data Library**

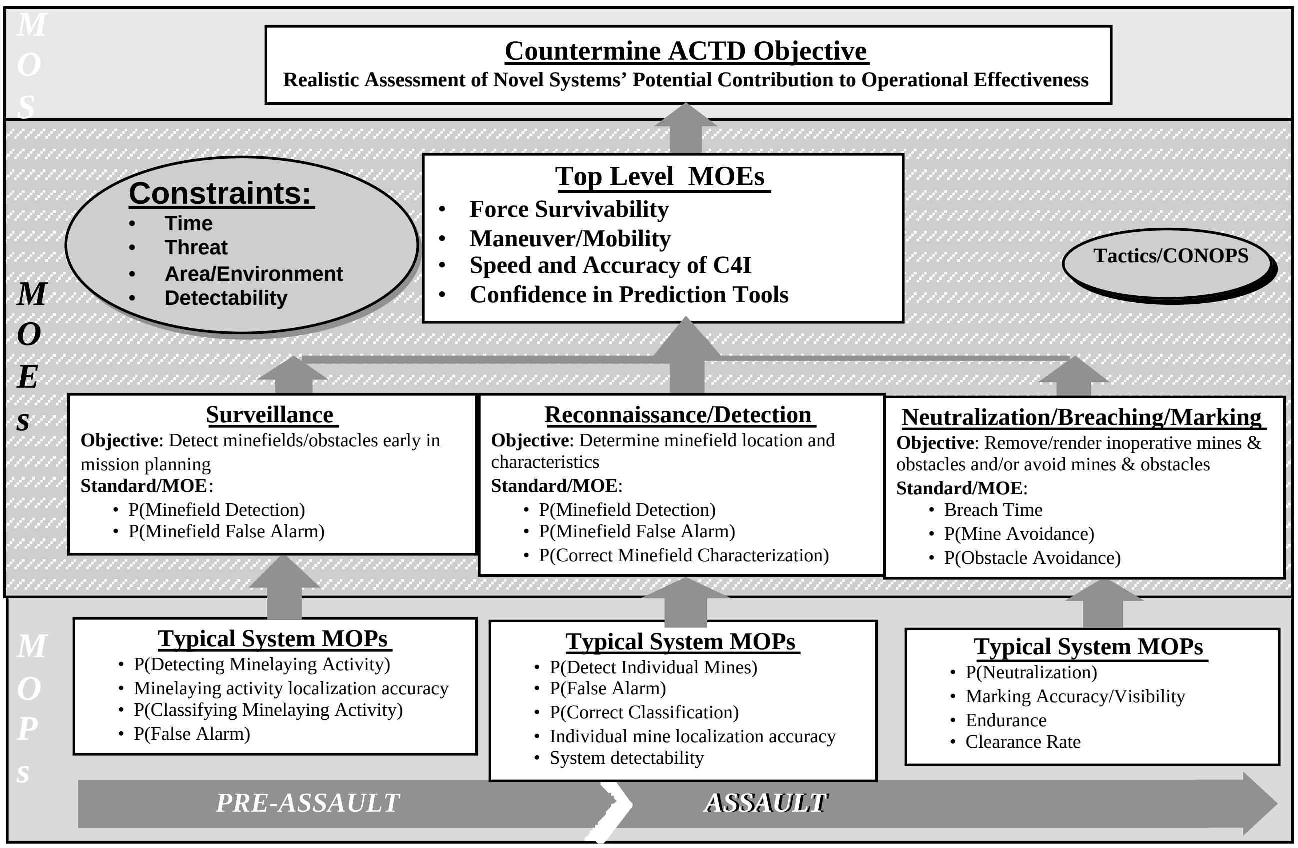
***These numbers reflect an update of the numbers presented to the Breakfast Club**

Measures of Success, Effectiveness, and Performance

The Joint Countermine ACTD provides a structure for evaluating the contribution of novel systems to the effectiveness of countermine operations in support of amphibious and land operations. The user evaluation of the performance of the novel systems in the ACTD will support decisions regarding support of residuals. Therefore, at the programmatic level, the success of the Joint Countermine ACTD depends on: 1) effective evaluation of the warfighting utility of the participating systems and architectures, and 2) additional understanding of the capabilities of the current and potential countermine system of systems.

System level measures of effectiveness are needed to satisfy these two objectives. The countermine operational MOEs satisfy the following criteria: 1) the MOEs are quantifiable and measurable quantities; 2) they are intuitively clear and understandable; 3) they are consistent with existing doctrine; and 4) they are consistent with JCOS to permit extension of the ACTD results to untested environments and scenarios.

Figure 19 illustrates the bottom-up flow from the measures of performance of the elements of the MCM system to the measures of effectiveness of each phase of the MCM operation, and finally to the overall top level measures of effectiveness. The success of the MCM operation depends on the success of each phase. Figure 19 also summarizes the basic objective of each MCM phase and decomposes the top level MOEs into phase specific MOEs. These MOEs in turn depend on the employment of component systems, whose performance is characterized by their own set of MOPs. Typical MOPs are listed for systems that are associated with each of the three fundamental MCM phases.



Countermine Operational Objectives And Measures
Figure 19

The top level MOEs emphasize force survivability, mobility, and situational awareness, which are factors the CATF must consider in his decision to enter the assault phase. The resulting top level countermine MOEs are:

Force survivability. This performance factor is the actual assault force survival rate experienced during the amphibious landing and subsequent land based operation. The overarching objective of MCM is to reduce the ATF's attrition through effective countermine operations.

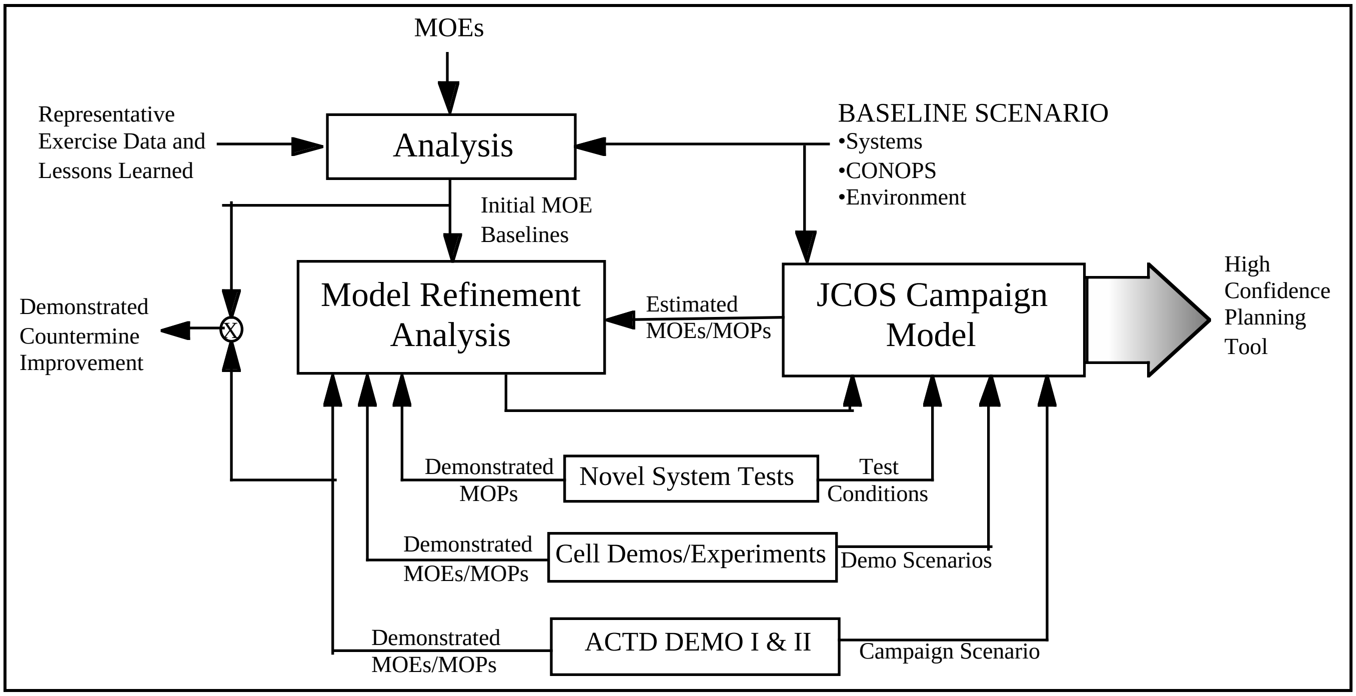
Maneuver/Mobility. The efficiency and tempo at which the operation can be executed is directly related to the degree of maneuverability and mobility enabled by effective countermine operations.

Speed and accuracy of C^4I. Feedback from systems and forces is required as soon as possible to maintain an accurate view of the battlespace as the operation unfolds. Seamless transition from the sea is possible only with accurate, near real time information about the progress of MCM operations.

Confidence in Prediction Tools. As the countermine operations proceed through the pre-assault and assault phases, the prediction of the ATF attrition is constantly updated to support a Go/No-go decision, selection of assault lanes, deployment of assets, etc. The knowledge of the confidence in the survival and mobility predictions is an important factor in the tactical decision process. For example, a decision may be delayed until a confident force survival prediction is available, even if the point-estimate of the survival rate does not change.

The effectiveness of the MCM operation depends on the associated scenario, tactics, systems CONOPS, and a set of constraints including the time available for the operation, the actual and perceived mine threat, the physical environment, and the desired level of detectability.

Because the ACTD is a demonstration program it is necessarily limited in the amount of data collected and the range of environments and scenarios tested. JCOS plays a central role in extrapolating the ACTD results to other cases. In addition, a validated JCOS represents an important ACTD residual in itself, serving as a tactical decision aid capable of estimating the top level MOEs. Figure 20 illustrates how JCOS will be developed and refined to constitute an effective tactical decision aid through the incorporation of (1) individual systems' test data and (2) observed values of the top level MOEs determined from the ACTD experience. A critical feature of this process will be utilization of novel systems' test program data to refine models as implemented in JCOS and contribute to an effective characterization of the top level MOEs. Intermediate-level MOEs are necessary to enable effective extrapolation of systems-level test results to the campaign level.



Measures of Effectiveness
Baselining and Evaluation Process
Figure 20

A special effort will be made to ensure that adequate data are collected during the demonstrations to allow meaningful evaluations of the participating systems and architectures. The Demonstration Managers will convene an independent team to review the Demonstration Plans and to ensure that all data necessary to support the evaluation process are clearly identified, sourced, and reflected in the data collection sections of the Demonstration Evaluation Plans. In addition, a “Red Team” will be assembled to review the conduct of the demonstrations, observe all phases of the exercise on a non-interference basis, participate in the exercise debriefings, and submit an independent assessment to the Demonstration Managers.

Qualitative assessments will be provided by the user and OSD sponsor. Quantification of the measures of effectiveness will be an ongoing process throughout the Joint Countermine ACTD as scenarios and user unit strengths mature and as system performance measures are verified. Measures of performance are currently quantified by exit criteria or requirements documents.

APPENDIX A

GLOSSARY

ACRONYMS AND ABBREVIATIONS

AAAV - Advanced Amphibious Assault Vehicle
ABMS - Assault Breach Marking System
ACP - Army Classified Program
ACTD - Advanced Concept Technology Demonstration
ALISS - Advanced Lightweight Influence Sweep System
AMCM - Airborne Mine Countermeasures
AP - Anti-Personnel
APOBS - Anti-Personnel Obstacle Breaching System
ASA (RDA) - Assistant Secretary of the Army for Research, Development, and Acquisition
ASM - Armored System Modernization
ASTAMIDS - Airborne Standoff Minefield Detection System
AT - Anti-Tank
ATD - Advanced Technology Demonstration
BLNS - Breach Lane Navigation System
C^4I - Command, Control, Communications, Computers, and Intelligence
CIMMD - Close-In Man Portable Mine Detector
CLAMS - Cleared Lane Marking System
CNR - Chief of Naval Research
COBRA - Coastal Battlefield Reconnaissance and Analysis
COMINEWARCOM - Commander, Mine Warfare Command
COMSUBLANT - Commander, Submarine Force Atlantic
COMSUBPAC - Commander, Submarine Force Pacific
COTS - Commercial-Off-the-Shelf
DEMNS - Distributed Explosive Mine Neutralization System
DEM VAL - Demonstration/Validation
DET - Distributed Explosive Technology
DIS - Distributed Interactive Simulation
DON - Department of the Navy
DSI - Defense Simulation Internet
DUSD (AT) - Deputy Undersecretary of Defense, Advanced Technology
EN - Explosive Neutralization
EOD - Explosive Ordnance Disposal
GCCS - Global Command and Control System
GPS - Global Positioning System
IOC - Initial Operational Capability
JAMC - Joint Amphibious Mine Countermeasures
JCOS - Joint Countermine Operational Simulation
JMCIS - Joint Maritime Command and Information System
LCAC - Landing Craft, Air Cushion
MARCORSYSCOM - Marine Corps System Command
MARFORLANT - Marine Corps Forces Atlantic
MARS - Multiwarfare Assessment and Research System
MCAC - Multimission Craft, Air Cushion
MCM - Mine Countermeasures
MCMCSS - Mine Countermeasures Command and Support Ship
MEDAL - Mine Warfare Environmental Decision Aids Library
ML-A - Magic Lantern–Adaptation
MMS - Marine Mammal Systems

MNS - Mission Need Statement
ModSAF - Modular Semi-Automated Forces
MOE - Measure of Effectiveness
MS - Milestone
NAVAIRSYSCOM - Naval Air Systems Command
NMRS - Near-Term Mine Reconnaissance System
NTCS-A - Navy Tactical Command System-Afloat
OBS - Obstacle Breaching System
ONR - Office of Naval Research
ORD - Operational Requirements Document
ORSMC - Off-Route Smart Mine Clearance
PEO-ASM - Program Executive Office-Armored Systems Modernization
PEO-MIW - Program Executive Office-Mine Warfare
PMO - Program Management Office
RDT&E - Research, Development, Test and Evaluation
RMOP - Remote Minehunting Operational Prototype
SABRE - Shallow Water Assault Breaching
SAE - Service Acquisition Executive
SEAL - Sea-Air-Land
SS - Sea State
SWCM - Surface Mine Countermeasures
SWMCM - Shallow Water Mine Countermeasures
TENCAP - Technical Exploitation of National Capabilities
TRADOC - Training and Doctrine Command
TYCOM - Type Command
UAV - Unmanned Aerial Vehicle
USACOM - United States Atlantic Command
USSOCOM - United States Special Operations Command
UUV - Unmanned Underwater Vehicle

APPENDIX B

NOVEL ELEMENTS

NOVEL ELEMENTS

Novel elements are defined as the products of science and technology programs prior to Milestone I in the acquisition process, or as products in the pre-production phases of the development cycle. The following is a list of the novel elements expected to be available for the ACTD. If an indicated system is not available during the demonstration period, contingency systems will be used that provide a similar capability.

Hamlet's Cove:

Function: Detects in-water, surface, and buried on-shore mines; provides characterization of beach defense positions and geomorphological features.

Description: Synergistic capability of national, tactical and commercial sensors to collect intelligence information to support littoral warfare.

Status: Demonstration scheduled in FY 96.

Top level performance: Precise determination of characteristics of littoral regions; number, type, location, and characteristics of mines; and the location and characteristics of littoral obstacles.

Sponsor/Program Manager: Cooperative effort among ONR, Navy/USMC TENCAP, and National Agencies; ONR, Dr. James DeCorpo, (703) 696-5121

Issues: None

Residual capability: TBD

Near-Term Mine Reconnaissance System (NMRS):

Function: Provides clandestine minefield reconnaissance in littoral waters.

Description: Submarine-launched, UUV with mine detection and classification sensors. NMRS is being developed as a "special category" acquisition program for fleet delivery and use.

Status: A prime contract for development of one NMRS operational prototype system, consisting of two UUVs; launch and recovery equipment; and shipboard command, control and support equipment; was awarded in August 1994 and definitized in February 1995. The system will reach initial operational capability (IOC) in early FY 98, when it will be transferred to COMSUBLANT or COMSUBPAC for operational use.

Sponsor/Program Manager:
Resource Sponsor: CNO (N87)
Program Manager: PMO-403, CAPT C. B. Young, (703) 602-6613

Issues: None

Date system(s) will be available for DEMOs: The NMRS will be in operational use by the TYCOM in early FY 98 and could, if arranged with the TYCOM, participate in the second ACTD demonstration, scheduled for late FY 98.

Residual capability: The single NMRS being developed by the Navy will be "owned" by the TYCOM. It is expected to have an operational life of 6 years.

Advanced Sensors:

Function: Sensor suite to detect volume and bottom mines from a 21-inch-diameter UUV.

Description: Sensor suite consisting of a Torodal Volume Search Sonar, which searches the entire water column in a single pass, a Side Looking Sonar with improved resolution over current systems, and an electro-optic sensor for mine identification.

Status: Individual sensors are now under development. Multisensor integration capabilities will be demonstrated during the ACTD.

Top Level Performance: Demonstrated capability to detect, classify, and identify volume, close tethered, bottom, and buried mines with enhanced performance over existing systems.

Sponsor/Program Manager: ONR, Dr. W. Ching, (703) 696-0804

Issues: Demonstration platform TBD.

Residual capability: Yes/1

Magic Lantern-Adaptation (ML-A):

Function: Detects and locates minefields in amphibious landing areas/surf zone.

Description: Proof of concept technology demonstration, which uses helicopter-based scanned and stabilized electro-optic sensor. It is a basic modification to the Magic Lantern system, which will demonstrate imaging, detection, classification, and localization of mine-like objects in the surf zone through the landing craft zone.

Status: Contractor and Navy tests begin in FY 95 for a decision to proceed with the development of the system.

Top level performance: Designed for day or night operation and detects small anti-invasion and anti-tank mines. Speed of advance is approximately 75 knots.

Sponsor/Program Manager: ONR, Dr. W. Ching, (703) 696-0804;
PEO-MIW/PMO-210, Mr. Tom Schlegel, (703) 602-5098

Issues: Cost of system for ACTD and the obsolescence of the SH-2F helicopter, the present system deployment platform.

Residual capability: TBD

Coastal Battlefield Reconnaissance and Analysis (COBRA) System:

Function: Detects beach minefields, obstacles, and fortifications.

Description: System consists of multispectral video sensors. Sensor data will be linked to a ground-based facility for near-real-time analysis of detection data.

Status: Current ATD program (MARCORSYSCOM). Prototype scheduled for FY 96 OT(O)/Demo.

Top Level Performance: Mine and obstacle detection and localization capability for surface and buried mines. The probability of detection of surface mines will be 90 percent and buried mines, 75 percent. The system will be equipped with the differential GPS and will provide area coverage rates of up to 1.4 square nautical miles per hour at speeds of up to 60 knots.

Sponsor/Program Manager: MARCORSYSCOM/MAJ Walter Hamm, (703) 640-2220

Issues: No suitable data link available for the Pioneer UAV based system. During ACTD timeframe, COBRA will therefore be flown on manned fixed-wing aircraft capable of data linking.

Residual capability: Yes/1

Airborne Standoff Minefield Detection System (ASTAMIDS):

Function: Detects and identifies boundaries of buried and surface patterned minefields, unpatterned scatterable minefields, and buried nuisance mines on unpaved roads.

Description: Passive infrared sensor on an unmanned airborne platform. An active laser sensor may also be included. Sensor image data is transmitted to a mobile ground station for processing and generation of mine detection reports.

Status: Army DEM/VAL program. MS II–2Q FY 97.

Top level performance: TBD

Sponsor/Program Manager: PM-MCD/Mr. Phil Purdy, (703) 704-1970

Issues: Availability of hardware for ACTD.

Residual capability: Yes/1

Close-in Man Portable Mine Detector: (CIMMD):

Function: Hand-held detection of buried and surface laid metallic and non-metallic mines.

Description: Integrated infrared sensor and ground penetrating radar sensor suite with advanced signal processing.

Status: ATD scheduled for 4Q FY 95. Milestone I is scheduled for 1Q FY 96.

Top Level Performance: The ATD exit criteria are probabilities of detection for anti-tank metallic, anti-tank non-metallic, anti-personnel metallic, and anti-personnel non-metallic mines of 92, 80, 92, and 50 percent (minimum), respectively, with no more than one false alarm per 5 square meters.

Sponsor/Program Manager: CECOM RDEC/Mr. Mark Locke, (703) 704-2418

Issues: TBD

Residual capability: Yes/5

Extended C⁴I Systems:

Function: Extends selected interoperable data and voice communication among Army, Navy, and Marine Corps ACTD elements within the developing Joint Maritime Command Information System (JMCIS) architecture.

Description: Will link MCM units and information into the standard Navy JMCIS architecture.

Status: Currently unfunded

Top Level Performance: Will be developed during the initial stages of this ACTD.

Sponsor/Program Manager: SPAWAR

Issues: Hardware for surface MCM funded.

Residual capability: TBD

Distributed Explosive Technology (DET) System:

Function: Provides a mine clearance capability from the beach to 3 feet water depth.

Description: The DET system is a distributed explosive net array (60 yd x 60 yd) consisting of parallel lines of explosive detonating cord spaced to optimize performance in the shallow end of the surf zone. The DET systems will be deployed from the deck of an LCAC using two MK22 MOD4 rocket motors and detonated by a fire-and-forget fuze. The DET systems will be used in conjunction with multiple Shallow Water Assault Breaching (SABRE) systems to achieve the lane clearance required. The DET arrays will be deployed end-to-end if necessary to cover the region from 3 ft deep to the waterline. Multiple SABRE systems will cover the remainder of the lane.

Status: DET is now in Milestone I development.

Top Level Performance: Multiple systems may be required to clear 90 percent of the mines in the 0- to 3-foot depth zones in concert with the SABRE system.

Sponsor/Program Manager: PMO 407-42/Mr. William Hinckley, (703) 602-2910 (Ext. 442)

Issues: Interoperability of DET and SABRE from a single LCAC.

Date system(s) will be available for DEMOs: DEMO I and DEMO II can be approved with inert rope arrays, stock MK22 Mod 4 rocket motors, and a launch control unit. The System Effectiveness Model (SEM) and Distributed Explosive Performance Model will also be available to support the ACTD demonstration.

Residual capability: Inert rope array systems for residual capability will be available. Refurbishment and re-packaging will be required. Rocket motors are available in Marine Corps stock.

Explosive Neutralization (EN) ATD:

Function: Provides in-stride capability to provide mine clearance in the surf zone through the craft landing zone.

Description: Consists of three clearance concepts, two for surf zone clearance and one for beach zone clearance. For the surf zone there is an improved line charge, which provides mine and limited obstacle clearance, deployed with an improved rocket which provides range sufficient for MCAC hover operations up to Sea State 3. Similarly, an improved net is being developed for mine clearance which will meet the required range with new rockets. Range for these systems was designed to keep the MCAC out of breaking surf in a nominal surf zone during deployment. These two systems are being deployed from the MCAC utilizing an advanced fire control system for accurate navigation and placement. The third concept utilizes an unpowered glider, guided via GPS, which will deploy a net utilizing munitions technology to clear the beach zone. Shaped charges provide a hard kill capability against land mine threats.

Status: Concluding 2nd year of a 5-year 6.3A effort. All efforts are pre-Milestone I.

Top Level Performance: Improved line charge and explosive arrays will provide 90 percent clearance through the surf zone, utilizing multiple systems. Performance is optimized for water depths of 3 feet and greater. An improved surf zone array will provide 90 percent clearance in the surf zone (0-3 ft). The beach zone system will clear 90 percent of surface laid and buried mines independent of fuze type.

Sponsor/Program Manager: PMO 407-42, Mr. William Hinckley, (703) 602-2910 (Ext. 442)

Issues: New rocket motors are not yet qualified for fleet use.

Date system(s) will be available for DEMOs: Demonstration I: will be supported; with inert line charges and inert surf zone arrays without rocket motors. No beach zone demonstrations will be available for the first demonstration. Demonstration II: will be supported with the materials mentioned above for Demonstration I and a fire control system and an inert beach zone array. An EN ATD SEM will be available that incorporates data from the FY 97 tests.

Residual capability: No hardware will be available due to lack of qualification of the rocket motors. The SEM will be made available.

Joint Amphibious Mine Countermeasures (JAMC) System:

Function: Neutralizes advanced/hardened mines and destroys light obstacles on the beach during an amphibious assault. Provides cleared lane from the transition zone to the craft landing zone.

Description: Remote controlled land vehicles with mechanical, electromagnetic, and explosive MCM systems as well as visual and electronic marking systems.

Status: ATD demonstration under near-operational conditions in 4Q FY 95. Milestone I/II in 1Q FY 98.

Top Level Performance: All weather, day or night operation in a limited hostile environment. It will clear a 50- by 150-yard lane in 1.5 hours with a 90 percent mine clearance capability.

Sponsor/Program Manager: MARCORSYSCOM/MAJ W. Hamm, (703) 640-2761

Issues: None

Residual capability: Yes/3

Off-Route Smart Mine Clearance System (ORSMC):
Function: Neutralizes smart off-route mines.

Description: Remote controlled land vehicle which neutralizes off-route mines by duplicating multiple characteristic vehicle signatures used by the threat mine for target acquisition, tracking, and fire control. The ORSMC platform evades destruction after mine firing by using passive/low observable warhead countermeasures.

Status: Joint ATD program (Army/Marine Corps). A technical demonstration of a remotely controlled decoy to breach lanes through minefields covered by smart off-route mines is scheduled for FY 96.

Top Level Performance: All-weather, day or night operation. It will clear 90 percent of smart standoff mines within a 100-meter radius while operating at 10 mph.

Sponsor/Program Manager: MARCORSYSCOM/MAJ W. Hamm, (703) 640-2761, and CECOM RDEC/Mr. Ricky Stanfield, (703) 704-2452

Issues: Ability to defeat side attack mines.

Residual capability: Yes/3

Army Classified Program (ACP):
Function: Standoff neutralization of mines.

Description: Classified

Status: Three contractors currently working on system.

Top Level Performance: Classified

Sponsor/Program Manager: CECOM RDEC/Dr. David Lee, (703) 704-1063

Issues: TBD

Residual capability: Yes/2

Advanced Lightweight Influence Sweep System (ALISS):
Function: Sweeps acoustic and magnetic influence mines in VSW .

Description: Influence source which could be mounted on a remotely controlled air cushion vehicle. It utilizes a superconducting magnetic solenoid and an advanced acoustic source to sweep magnetic and acoustic influence mines in VSW. It simulates combatant and assault craft by emulating their signatures. It meets the goals of the over-the-horizon in-stride shallow water mission.

Status: Currently an ATD program with a demonstration scheduled for FY 97.

Top Level Performance: The ATD demonstration hardware will have a sweep output that will simulate assault craft (LCAC and AAAV) to a path width compatible with the MRC West over-the-horizon in-stride amphibious assault mission. Environmental conditions are limited to Sea State 2 (SS2). Operating speed will be 25 knots with a goal of 35 knots.

Sponsor/Program Manager: ONR, Dr. W. Ching, (703) 696-0804;
PMO 407-47, Ms. Colleen Merlihan, (703) 602-2910 (Ext 447)

Issues:

a. Host Platform–The ATD hardware is being designed for testing from SES 2000 platform. Because the hardware is technology demonstration equipment, it is not designed to be used on any other operational platform without significant modification.

b. Maintenance–Because the ALISS FY 97 test program will take the equipment to the end of its useful life, any use by the ACTD program will require a major refurbishment of the equipment. Spares are expected to be consumed during the 1997 testing, and new spares for the ACTD will have to be purchased. Expected refurbishment cost is $500,000.

c. Operation–The ALISS equipment is being designed for O-level maintenance to be performed by engineers and specially trained technicians. It is not considered practical for typical mine warfare personnel to operate and maintain this equipment without support from engineers and technicians. It is anticipated that for a 2-week test, engineering and technician support costs will run approximately $55,000.

d. Documentation–Limited documentation is available. Limited operating procedures will be available and necessary tactics have not been developed.

Date system(s) will be available for DEMOs: The equipment will be available in FY 98, but will require refurbishment prior to use.

Residual capability: TBD

Shallow Water Assault Breaching System (SABRE):

Function: Clears lane of mines through the surf zone to the beach.

Description: A 400 foot line charge, consisting of approximately 130 discrete shells (each containing 10 lbs of high explosives) at 3 ft spacing, designed to detonate at the bottom of the Surf Zone using a “fire and forget” fuze with a delay detonator. This system will be deployed by a MK22 MOD4 Rocket Motor from the deck of a LCAC where one or more SABREs can be used in connection with the DET System currently under development .

Status: Developmental system. Milestone I was achieved in FY 95. Milestone II is scheduled for FY 96.

Top Level Performance: Use of multiple SABREs can clear lanes of any described depth and width through the surf zone to the beach.

Sponsor/Program Manager: PMO 407-48, Mr. Jeffrey L Johnson, (703) 602-2274 (Ext 448)

Issues: Interoperability of DET and SABRE from a single LCAC.

Residual capability: Limited. Full-up system will not go to the user until production systems are built due to explosive safety considerations. Inert system with launch controller may be made available.

APPENDIX C

RISK ASSESSMENT

RISK ASSESSMENT

Hamlet's Cove:

The overall risk of the Hamlet's Cove development is medium. Resolution, processing, and information dissemination are the risk areas. During Desert Storm, remote sensors were used to collect information concerning coastal and beach defensive arrays. The BEACHCOMBER initiative showed that processing exploitation of sensor data could provide a very useful picture for the warfighter. Hamlet's Cove builds on these previous efforts.

Near–term Mine Reconnaissance System (NMRS):

The NMRS technical risk is low to medium because the system builds extensively on previously demonstrated UUV and sensor developments. The schedule risk is considered moderate, but is being mitigated through the use of various acquisition streamlining initiatives.

Advanced Sensors:

The risks associated with the Advanced Sensor Suite include possible schedule risks for the Torodal Volume Search Sonar and Electro-optic Sensor. These sensors have commitments to other programs. The overall risk is assessed as medium.

Magic Lantern-Adaptation (ML-A):

The overall risk associated with ML-A is high at this time. Image processing, real-time data dissemination, and performance in turbid water against small targets are the risk areas. Contractor and Navy tests of this system will occur in the FY 95 timeframe. Cost risk is high.

Coastal Battlefield Reconnaissance and Analysis (COBRA) System:

The overall risk associated with the COBRA is medium and is driven by data analysis development. Risks are being controlled by project emphasis on required data reduction and data analysis technology development.

Airborne Standoff Minefield Detection System (ASTAMIDS):

Overall risk is medium due to risks associated with algorithm development. These risks will be controlled through continuing management emphasis.

Close-in Man Portable Mine Detector System (CIMMD):

Overall risk is medium due to the technical challenges associated with detection of non-metallic mines and metallic mines in a high clutter environment. Risks associated with these challenges are being mitigated through exploration of multiple detection technologies and combinations of technologies and by conducting early component testing and extensive Government research.

Extended C^4I Systems:

Although these systems have not been fully defined at this time, the overall risk for them is low to medium. Efforts to develop these systems will focus on utilizing current capabilities and COTS hardware and maximizing integration with other developing architectures, e.g., Combined Arms Command and Control (CAC^2), JMCIS, Unified Build, Navy Tactical Command System–Afloat (NTSC-A), etc.

Distributed Explosives Technology (DET):

DET capability is currently limited in range and in the sea state in which it can be employed. These issues are being addressed under the ENATD project. DET's overall risk for ACTD purposes is assessed as medium.

Explosive Neutralization (EN) Advanced Technology Demonstration:

The risk is high due to launch system and seaborne platform considerations. Progress will be monitored closely.

Joint Amphibious Countermeasures System (JAMC):

The overall risk is medium due to the unprecedented integration of multiple MCM sub-systems on a remote controlled land vehicle. Risk is mitigated through additional testing and systems engineering.

Off-Route Smart Mine Clearance (ORSMC) System:

Overall risk is medium due to the immature side-attack mine countermeasures technology. Mitigation is provided by technology development emphasis.

Army Classified System (ACP):

Overall risk is classified.

Advanced Lightweight Influence Sweep System (ALISS):

The ALISS magnetic system is based on superconducting technology. This technology has never been demonstrated in the harsh vibration and shock levels associated with influence mine sweeping. Another area of risk is the development of a closed cycle cooling system for the superconducting solenoid. This system is required to eliminate the need to manufacture or store liquid helium supplies aboard Navy ships. The spark gap technology, being developed for the acoustic portion of the sweep system, has yet not been demonstrated in a fieldable system. Overall risk is assessed as high.

Shallow Water Assault Breaching System (SABRE):

The overall risk for purpose of inclusion in the ACTD is assessed as medium. The current SABRE system is not stabilized and is dependent on a stable platform for precise launch. This issue is being addressed and corrected under the ENATD program. Explosive safety tests may not be complete in time for live system use in ACTD demonstrations.

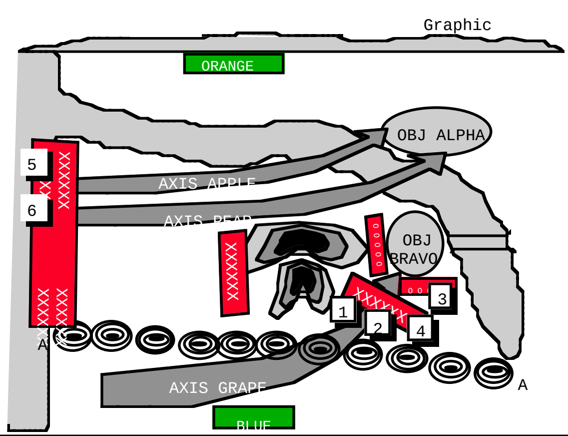
APPENDIX D

DEMONSTRATION 1
MEASURES OF SUCCESS
AND
MEASURES OF EFFECTIVENESS

Introduction

The JCM ACTD Management Plan (pp. 29-32) explains the development and use of the measures of success, effectiveness, and performance for the JCM ACTD. This appendix provides examples of how specific systems' MOPs can be used to estimate the marginal contribution of those systems to the phase-level MOEs for a specific scenario. To date, segments of a notional Demonstration I scenario have been analyzed through the use of small vignettes. Improvements in survivability and maneuver mobility over baseline Army and Marine capabilities are shown for selected systems. Simulations, associated analysis methodology, and scenarios are not currently available to enable aggregation of vignette results into top level MOEs for a determination of improvement to the entire amphibious assault. Future analyses, coupled with maturing JCOS capabilities will provide more comprehensive predictions and assessments consistent with the approach described in the body of the Management Plan.

Based on Mine Countermeasures War Game, Quantico 20-23 Mar 95



SITUATION

- Orange (Threat) invades Blue from north and occupies captured territory
- Blue halts invasion at Line A-A and creates a static situation
- Orange Mines avenues of approach, beach landing zones, and off shore areas as part of integrated defense with representative minefields
- Blue equipped with representative numbers of novel countermine equipment

MISSION

- Attack and drive Orange out of Blue territory and Re-establish the international border
- Be prepared to assist the UN peacekeeping operations

CONCEPT

- US Army Airborne division inserted into Blue unopposed to establish airhead/sea port for follow-on heavy forces. Army conducts main attack along AXIS GRAPE to OBJ BRAVO
- US Navy steams to waters off-shore of Blue, lands USMC amphibious task force at two beach heads for inland operations along AXIS APPLE and PEAR to OBJ ALPHA

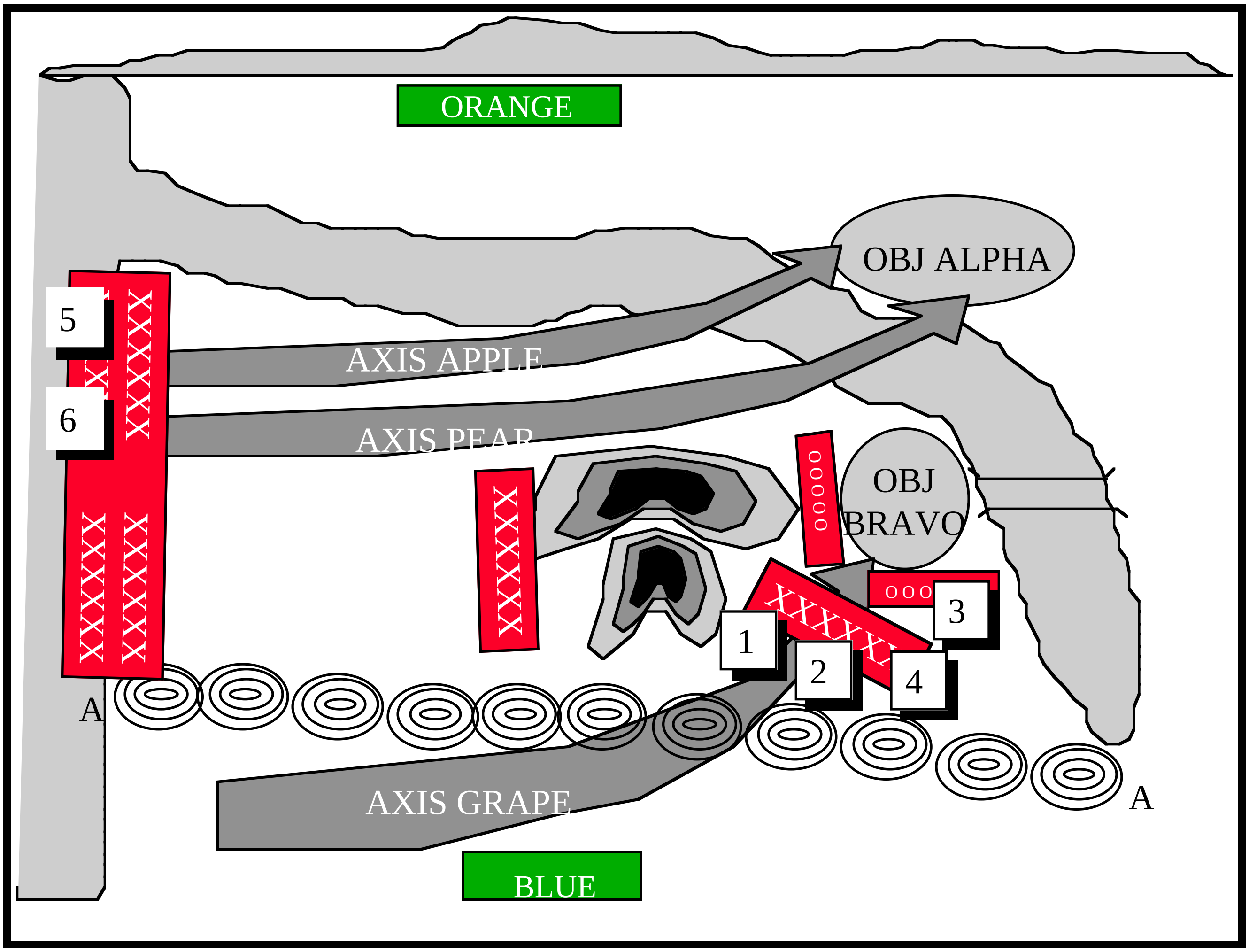
Notional Demo I Scenario
Figure 1

Notional Scenario

The notional scenario for this analysis is consistent with the previously exercised joint scenario for the Mine Countermeasure War Game conducted at Quantico on 20-23 March 1995. The situation, mission, and concept of operations are depicted in Figure 1. The scenario allows for the execution of six vignettes which are intended to emphasize the performance parameters of specific novel systems. Within these more focused vignettes, the contribution to the overall mission success of any individual novel countermine system can better be observed, measured, and understood.

Vignette Description

A. Figure 2 and Table 1 depict the six specific operational vignettes used in determining the benefit each system brings to the battlefield. Figure 2 graphically depicts the vignettes seen within the context of the overall scenario. Table 1 contains a matrix which shows the relationships of: a) the sub-elements of each of the vignettes; b) the operational phase, and; c) the novel system performance. The expected benefit of each of these novel systems is expressed in terms of the two measures of effect: a) increased breach force survivability and b) improved maneuverability/mobility.



Notional Scenario Graphic
Figure 2

	Vignette	Survivability	Maneuver/ Mobility	Current Countermine Capability	Novel and Developing System	Comment
AXIS GRAPE Army	1. Minefield Detection Prior to Encounter	Avoid Unexpected Minefield Encounter	Improved Route Planning & Breach Force employment	None	**ASTAMIDS**	Pre-assault planning time needed for ASTAMIDS. Avoidance of unexpected encounter increases survivability
"	2. Minefield Breaching (Heavy)	Improved Breaching Effectiveness	Shortened CM system employment times	MICLIC Track Width Mine Plow	**ESMB ORSMC**	ORSMC needed to provide survivability for breaching assets from smart mines
"	3. Minefield Breaching (Dismounted)	Shortened Exposure Time	Shortened CM system employment times	Bangalore Torpedo	**APOBS**	Speed of employment increases survivability from enemy fire
"	4. Scatter-mine Counter-measures (Reseed of breach lane)	New counter-measure capability	New capability to reopen a closed lane	MICLIC Track Width Mine Plow	**ACP**	Deep magazine of ACP needed vs. scatterable mines
AXIS PEAR & APPLE USMC	5. Minefield Detection Prior to Encounter	Improved Precision of minefield location	Better assault planning and breach force employment	None	**COBRA ASTAMIDS**	Surf zone uncertainty may force routine employment of breaching assets
"	6. Minefield Breaching (Amphibious)	Improved breaching/ clearing effectiveness	Shortened system employ-ment times and faster area coverage rate	MICLIC Track Width Mine Plow	**JAMC ESMB ORSMC**	Improved effectiveness of breaching assets improves survivability

Scenario Breakdown by Sub-Element
Table 1

B. Vignettes 1 through 4 focus on the land portion of Demonstration I and the activities that support the movement to contact along AXIS GRAPE toward OBJ BRAVO.

1) Vignette 1. An Army heavy brigade task force conducts a movement to contact along AXIS GRAPE toward OBJ BRAVO. One of the novel countermine systems, an Airborne Standoff Minefield Detection System (ASTAMIDS) is flown over AXIS GRAPE in advance of the advancing combat forces. ASTAMIDS sensor data and the coordinates of minefield are downlinked to the brigade TOC, where the brigade commander directs appropriate bypass or breaching operations. This vignette is compared with a similar operation where the minefield location remains unknown until encountered. In the analysis without ASTAMIDS, the lead encounters the minefield without warning and sustains casualties. The brigade task force must then either execute a hasty obstacle breaching battle drill or end the movement to contact and establish a hasty defense in preparation for a deliberate breach. In the analysis with ASTAMIDS, the improved intelligence obtained from ASTAMIDS allows the brigade commander to plan for minefield avoidance or breach prior to encountering the minefield. The breach force does not sustain casualties from a minefield encounter without warning and maintains tempo.

2) Vignette 2. In this continuation of vignette 1, the heavy brigade task force has detected a minefield along AXIS GRAPE. The commander has decided to conduct breaching operations rather than bypass the minefield. Two novel countermine systems are used to breach the minefield: the Offroute Smart Mine Clearing (ORSMC) system and the Explosive Standoff Minefield Breacher (ESMB). Using these new systems, the task force can breach the minefield faster and safer than with current minefield breaching equipment. In the analysis without the novel systems, smart mines overwatching the minefield destroy four vehicles in the breach force. A lane through the minefield is breached using Mine Clearing Line Charge (MICLIC). The MICLIC is only effective against simple, single-impulse fused mines. The breach force sustains additional casualties during the proofing operation due to hardened mines in the "cleared lane" that survived the MICLIC blast. In the analysis with the novel systems, the ORSMC defeats all four of the smart mines, so no casualties are sustained due to smart mines. The ESMB is effective against all known mine types, a substantive improvement over the performance of MICLIC. With this improved rate of mine destruction, the breach force now sustains fewer casualties to mines and successfully breaches at higher tempo.

3) Vignette 3. Dismounted or light forces must breach an antipersonnel minefield with wire obstacles. A novel countermine system used to breach the minefield is the Anti-personnel Obstacle Breaching System (APOBS). Using APOBS, the dismounted forces can breach the anti-personnel minefield faster and safer than with current countermine breaching equipment, the bangalore torpedo. In the analysis without the APOBS, the time to set up and employ the bangalore torpedo exceeds 30 minutes. The breach force remains under enemy fire and observation and takes casualties during the entire employment period. In the analysis with the APOBs, both the employment time and the size of the breach force are reduced significantly. With this reduction in both exposure time and exposure numbers, casualties are reduced.

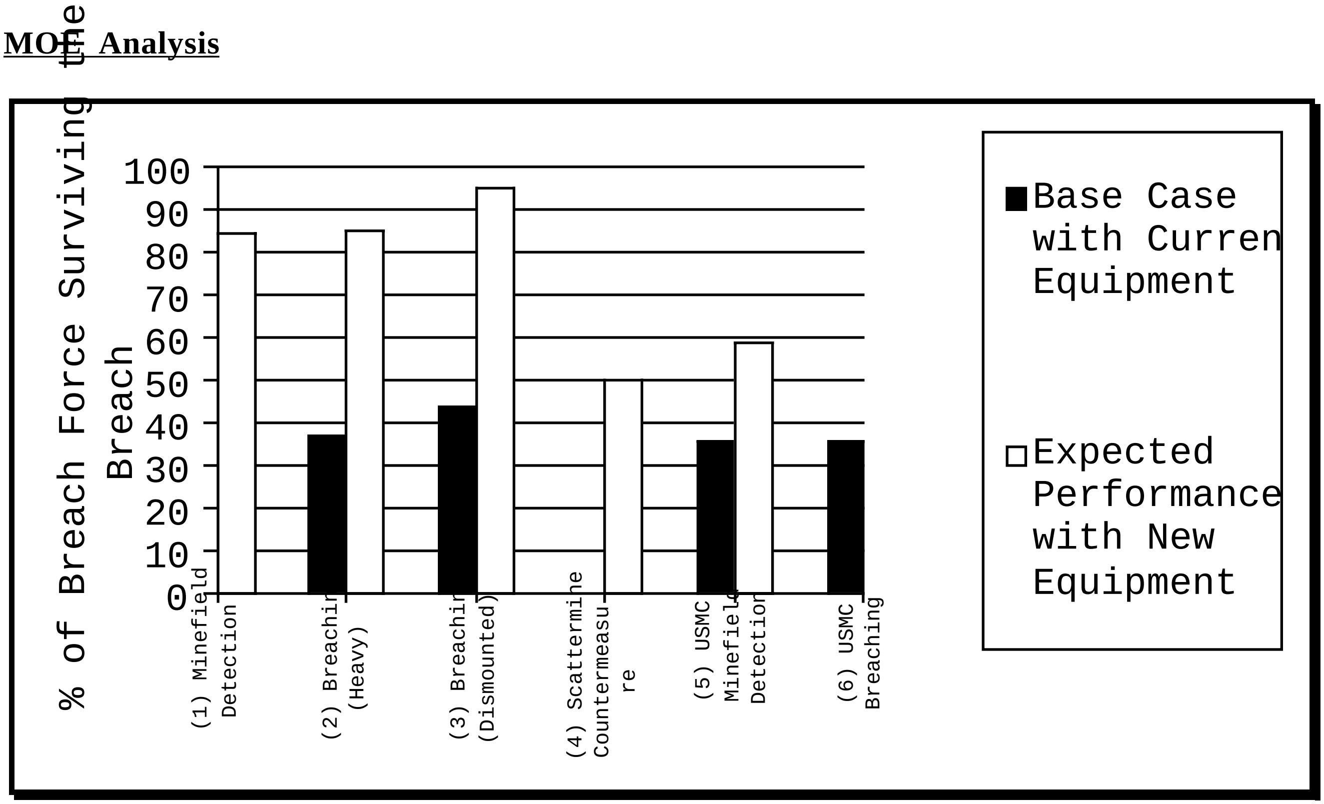
4) Vignette 4. The heavy brigade task force has successfully completed breaching the minefield in vignette 2. During the movement of the assault force through the breach, an enemy artillery delivered scatterable minefield closed the breach and seeded the minefield with scatter mines. Most of the brigade's breach force resources was exhausted in the initial breach, or is malpositioned to execute another breach. The novel countermine system used here is the Army Classified Program (ACP). As this program is classified, no detailed analysis is reflected here and all numbers and graphs are not the real numbers but are shown for example purposes.

C. Vignettes 5 and 6 focus on the amphibious landing portion of Demonstration I and the activities that support the amphibious landing and movement to contact along AXIS APPLE and AXIS PEAR toward OBJ ALPHA.

1) Vignette 5. An Marine Amphibious Task Force conducts an amphibious assault followed by a movement to contact along AXIS PEAR and AXIS APPLE toward OBJ ALPHA. The novel countermine systems, ASTAMIDS and Coastal Battlefield Reconnaissance and Analysis (COBRA) are flown over the littoral zone and the axis ahead of the advancing combat forces. Sensor data and the coordinates of minefields are downlinked to the Commander, Amphibious Landing Force (CATF) and Commander, Landing Force (CLF), where the commander directs appropriate bypass or breaching operations. This vignette is compared with a similar operation where the composition of the littoral obstacles remain unknown until the assault is underway. In the analysis without ASTAMIDS and COBRA, the lead company team encounters the minefield without detailed intelligence and sustains casualties. The amphibious task force must then either execute a hasty obstacle breaching drill or end the amphibious assault. In the analysis with ASTAMIDS and COBRA, the improved intelligence obtained from ASTAMIDS and COBRA allows the CATF and CLF to better plan and prepare for the minefield encounter. The breach force does not sustain the casualties and the tempo is maintained.

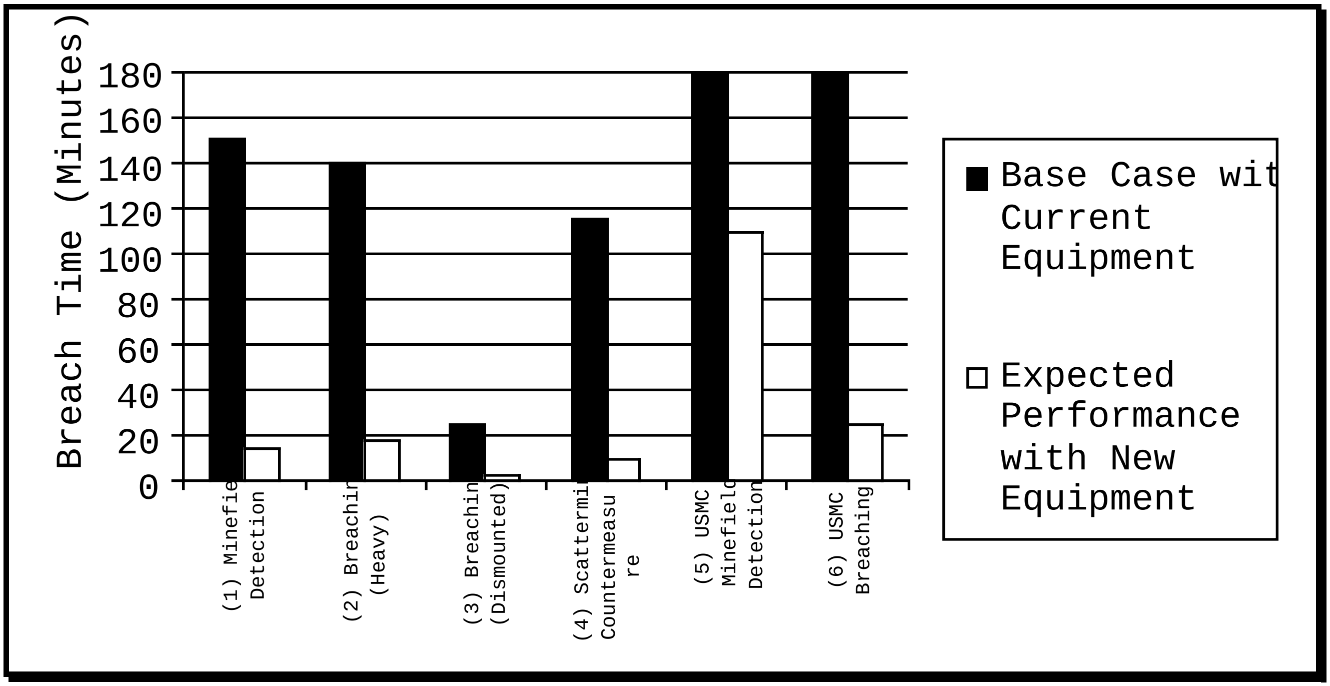
2) Vignette 6. In this continuation of vignette 5, the amphibious task force has detected a minefield. The commander has decided to conduct breaching operations. Three novel countermine systems are used to breach the minefield: ORSMC, ESMB, and Joint Amphibious Mine Countermeasures (JAMC). Using these new systems, the task force can breach the minefield faster and safer than with current minefield breaching equipment. In the analysis without the novel systems, smart mines overwatching the minefield destroy four vehicles in the breach force. A lane through the minefield is breached using Mine Clearing Line Charge (MICLIC). The MICLIC is only effective against simple, single-impulse fused mines. The breach force sustains additional casualties due to hardened mines in the "cleared lane" that survived the MICLIC blast. In the analysis with the novel systems, the ORSMC defeats all four of the smart mines, so no casualties are sustained due to smart mines. The ESMB is effective against all known mine types, a substantive improvement over the performance of MICLIC. JAMC can then get ashore and prepare the beach zone for follow-on assault and support forces. With this improved rate of mine destruction, the breach force now sustains fewer casualties

MOE Analysis



MOE 1 - Breach Force Survivability
Demo I Analysis of Notional Scenario
Figure 3

A. Measure of Effectiveness 1: Breach Force Survivability. Figures 3 shows the results of the six vignettes with and without the novel countermine equipment. The results are expressed in terms of the first measure of effectiveness: the percentage of the breach force that survives the breaching operation. The goal of the analysis is to limit the external variables that are introduced into the analysis so that any benefit of the novel systems can be better determined. To do this the analysis performed focused exclusively on the breach force, a tightly bounded portion of the overall combat force. If the breach force incurs the substantially improved survivability the analysis indicates, then the total force will certainly achieve some improved survivability. The question of the total force survivability is better investigated using a more detailed modeling and simulation effort where iterative computer runs can produce a statistically significant sample size (JCOS or service models for example). For the purpose of this analysis, the population was limited to the company sized force executing the breach as that force would most immediately and directly benefit by the novel countermine capability. The measure is the mathematical percentage of the breach force that survived the breach. The determination of an absolute value of success is not provided herein. Rather, the performance before and after the novel equipment is provided. Improvement is success.



MOE 2 - Breach Force Maneuver/Mobility
Demo I Analysis of Notional Scenario
Figure 4

B. Measure of Effectiveness 2: Breach Force Maneuver/Mobility. Figures 4 shows the results of the six vignettes with and without the novel countermine equipment. The results are expressed in terms of the second measure of effectiveness: the time needed to execute the breach by the force conducting the breaching operation. The goal of the analysis is to limit the external variables that are introduced into the analysis so that any benefit of the novel systems can be better determined. To do this the analysis performed focused exclusively on the breach force, a tightly bounded portion of the overall combat force. If the breach force incurs the substantially shortened breach time the analysis indicates, then the total force will certainly achieve some improved maneuver/mobility. The question of the total force maneuver is better investigated using a more detailed modeling and simulation effort where iterative computer runs can produce a statistically significant sample size (JCOS or service models for example). For the purpose of this analysis, the population was limited to the company sized force executing the breach as that force would most immediately and directly benefit by the novel countermine capability. The measure is the directly measured time used to conduct the breach. The determination of an absolute value of success is not provided herein. Rather, the performance before and after the novel equipment is provided. Improvement is success.

Conclusion

The goal was to define measures that were: quantifiable and measurable; directly related to the mission; were intuitively clear; could be calculated within JCOS; and could be validated by field demonstrations. These two measures are provided. These measures provide a realistic assessment of the novel systems' contribution to operational effectiveness as well as increasing the understanding of current and potential countermine capabilities. This analysis is the beginning of the ACTD analytical process. Over the next few months, in coordination with USACOM, these measures will be refined and expanded.